

QUALITY AND RENEWAL 2007

An overall evaluation of research at Uppsala University

2006/2007



UPPSALA
UNIVERSITET

Editors:

Joseph Nordgren
Lars Engwall
Anne-Sofie Gräslund
Per Andersson
Maivor Sjölund
Marcus Agåker

© Uppsala University 2007

ISBN 978-91-633-1549-7

urn:nbn:se-2007-36 (<http://urn.kb.se/resolve?urn=urn:nbn:se-2007-36>)

Printed by: Edita, Västerås, 2007

Contents

| | |
|---|-----|
| Preface | 9 |
| Executive summary | 11 |
| Part I: The Project | |
| 1 Introduction | 17 |
| 2 The Context of KoF07 | 19 |
| 2.1 The Swedish system in brief | 19 |
| 2.2 Uppsala University in brief | 21 |
| 2.3 Bibliography | 23 |
| 3 The KoF07 Project | 25 |
| 3.1 Introduction | 25 |
| 3.2 Project organization | 26 |
| 3.3 Defining units for evaluation | 29 |
| 3.4 Evaluation package | 30 |
| 3.5 Selecting experts | 32 |
| 3.6 Site visits | 33 |
| 3.7 Meeting with panel chairs | 34 |
| 3.8 Bibliometric study | 34 |
| Part II: Summary of the results | |
| 4 Expert panel evaluation | 39 |
| 4.1 General observations | 39 |
| 4.2 Humanities and Social Sciences | 50 |
| 4.3 Science and Technology | 68 |
| 4.4 Medicine and Pharmacy | 81 |
| 5 Bibliometric study | 87 |
| 5.1 Introduction | 87 |
| 5.2 Methodology | 87 |
| 5.3 Results | 88 |
| Part III: Panel Reports | |
| Panel Reports | 97 |
| 6 Panel 1 | 99 |
| 6.1 Department of Information Science, Division of Statistics ... | 99 |
| 6.2 Department of Economics, Faculty of Social Science | 105 |

| | | |
|----|---------|-----|
| 7 | Panel 2 | 111 |
| | 7.1 | 111 |
| | 7.2 | 111 |
| | 7.3 | 121 |
| | 7.4 | 126 |
| 8 | Panel 3 | 131 |
| | 8.1 | 131 |
| | 8.2 | 131 |
| | 8.3 | 133 |
| | 8.4 | 135 |
| | 8.5 | 137 |
| | 8.6 | 140 |
| | 8.7 | 142 |
| | 8.8 | 146 |
| 9 | Panel 4 | 149 |
| | 9.1 | 149 |
| | 9.2 | 150 |
| | 9.3 | 152 |
| | 9.4 | 154 |
| | 9.5 | 156 |
| 10 | Panel 5 | 159 |
| | 10.1 | 159 |
| 11 | Panel 6 | 165 |
| | 11.1 | 165 |
| | 11.2 | 166 |
| | 11.3 | 169 |
| | 11.4 | 173 |
| | 11.5 | 178 |
| 12 | Panel 7 | 181 |
| | 12.1 | 182 |
| | 12.2 | 184 |
| | 12.3 | 185 |
| | 12.4 | 187 |
| | 12.5 | 189 |
| | 12.6 | 191 |
| | 12.7 | 193 |
| | 12.8 | 196 |

| | | |
|------|--|-----|
| 13 | Panel 8 | 199 |
| 13.1 | General Observations and Recommendations of Panel 8 | 199 |
| 13.2 | The Centre for Gender Research | 200 |
| 13.3 | Section for Textile Studies | 203 |
| 13.4 | Department of Art history | 204 |
| 13.5 | Department of Literature | 206 |
| 13.6 | Department for Musicology | 208 |
| 13.7 | Department of Philosophy | 211 |
| 14 | Panel 9 | 215 |
| 14.1 | Introduction | 215 |
| 14.2 | Department of Economic History | 216 |
| 14.3 | Department of Archaeology & Ancient History | 218 |
| 14.4 | Department of Cultural Anthropology and Ethnology | 220 |
| 14.5 | Department of History | 222 |
| 14.6 | Centre for Multiethnic Research & The Programme for Holocaust and Genocide Studies | 224 |
| 14.7 | Department of ALM (Archive Science, Library and Information Science, and Museum & Cultural Heritage Studies) | 226 |
| 14.8 | Department of the History of Science and Ideas | 228 |
| 14.9 | General conclusions | 230 |
| 15 | Panel 10 | 233 |
| 15.1 | Department of Law | 233 |
| 16 | Panel 11 | 239 |
| 16.1 | Faculty of Theology | 239 |
| 17 | Panel 12 | 249 |
| 17.1 | Department of Mathematics | 249 |
| 17.2 | Division of Scientific Computing | 253 |
| 17.3 | Centre for Image Analysis | 256 |
| 18 | Panel 13 | 259 |
| 18.1 | Physics and Astronomy | 259 |
| 18.2 | Department of Theoretical Physics | 265 |
| 18.3 | Department of Nuclear and Particle Physics | 267 |
| 18.4 | Department of Neutron Research | 275 |
| 18.5 | Department of Astronomy and Astrophysics | 276 |
| 18.6 | Department of Physics | 280 |
| 19 | Panel 14 | 289 |
| 19.1 | General assessment of the departments and units | 289 |
| 19.2 | Department of Biochemistry and Organic Chemistry | 289 |
| 19.3 | Department of Photochemistry and Molecular science (FO-TOMOL) | 291 |
| 19.4 | Department of Physical Chemistry and Analytical Chemistry | 292 |
| 19.5 | Department of Materials Chemistry | 295 |
| 19.6 | Actions for successful development for Chemistry at UU | 297 |

| | | |
|----|---|-----|
| 20 | Panel 15 | 301 |
| | 20.1 Department of Bioorganic Chemistry - IBK | 301 |
| | 20.2 Department of Cell and Molecular Biology - ICM | 302 |
| | 20.3 Department of Evolution, Genomics and Systematics - IEGS | 305 |
| | 20.4 Department of Physiology and Developmental Biology - IFU | 309 |
| | 20.5 Department of Ecology and Evolution - IEE | 311 |
| | 20.6 The Linnaeus Centre for Bioinformatics - LCB | 314 |
| 21 | Panel 16 | 317 |
| | 21.1 Department of Earth Sciences | 317 |
| 22 | Panel 17 | 345 |
| | 22.1 Department of Engineering Sciences | 345 |
| 23 | Panel 18 | 359 |
| | 23.1 Department of Information Technology | 359 |
| 24 | Panel 19 | 379 |
| | 24.1 Research in the Faculty of Pharmacy | 379 |
| | 24.2 Department of Pharmaceutical Biosciences | 380 |
| | 24.3 Department of Pharmacy | 382 |
| | 24.4 Department of Medicinal Chemistry | 384 |
| 25 | Panel 20 | 387 |
| | 25.1 Department of Medical Cell Biology | 387 |
| | 25.2 Department of Medical Biochemistry and Microbiology | 391 |
| 26 | Panel 21 | 401 |
| | 26.1 Public Health and Caring Sciences | 401 |
| | 26.2 Department of Public Health and Caring Sciences, overall evaluation | 401 |
| | 26.3 Department of public health and caring sciences, specific units | 404 |
| | 26.4 Summary and general conclusions | 416 |
| 27 | Panel 22 | 421 |
| | 27.1 Introduction | 421 |
| | 27.2 Department of Women's and Children's Health | 423 |
| | 27.3 Department of Oncology, Radiology and Clinical Immunology | 425 |
| | 27.4 Department of Surgical Sciences | 426 |
| | 27.5 Department of Medical Sciences | 428 |
| | 27.6 Department of Public Health and Caring Sciences | 431 |
| | 27.7 Conclusions | 431 |
| 28 | Panel 23 | 433 |
| | 28.1 General assessment of neuroscience at the University of Uppsala | 433 |
| | 28.2 Department of Public Health/Geriatrics - dementia research | 435 |
| | 28.3 Department of Neurology | 438 |
| 29 | Panel 24 | 457 |
| | 29.1 Some overall comments by Panel 24 | 457 |
| | 29.2 Department of Genetics and Pathology | 458 |
| | 29.3 Department of Medical Sciences | 462 |
| | 29.4 Ludwig Institute for Cancer Research | 464 |

| | | |
|------|---|-----|
| 29.5 | Department of Medical Biochemistry and Microbiology | 466 |
|------|---|-----|

Part IV: Bibliometric study

| | | |
|-------|---|-----|
| 30 | External Report from Leiden University | 471 |
| 30.1 | Introduction | 472 |
| 30.2 | Bibliometric indicators | 473 |
| 30.3 | Data collection | 481 |
| 30.4 | Overall results | 495 |
| 30.5 | Indicators for faculties and research departments | 499 |
| 30.6 | Indicators of scientific collaboration | 507 |
| 30.7 | General comments and discussion | 507 |
| 30.8 | Main findings and conclusions | 511 |
| 30.9 | Statistical Test | 512 |
| 30.10 | References | 513 |

Part V: Appendices

| | | |
|---|---|-----|
| A | Distribution of departments and units on panels | 517 |
| B | Evaluation package | 521 |
| C | Terms of reference for expert panels | 531 |
| D | Panel report template | 535 |
| E | Panels member requirements | 537 |
| F | Panel members | 539 |
| G | Instructions to departments for the planning of panel site visits | 563 |
| H | Site visits | 567 |
| I | Results of questionnaire | 569 |
| J | Photos from the site visits | 575 |

Preface



In September 2006 the Vice-Chancellor of Uppsala University, Professor Anders Hallberg, initiated an overall evaluation of research at all faculties of the University. The objective was to identify strong research activities and activities with potential to develop into new strong areas of research. The evaluation was expected to assist the University management in the decision-making process for future strategic measures and to offer departments and faculties support in their quality development work.

The Vice-Chancellor invited me to plan and direct the evaluation. A plan for the project, named KoF07, a Swedish acronym for *Quality and Renewal 2007* was presented to, and approved by the University Board on October 26, 2006. The core of the evaluation was a peer-review process, where distinguished scholars of the international research community were invited as members of expert panels to review departments of Uppsala University during a spring semester week of 2007. Preparation before the site visits was based on written material provided by the departments. As a separate exercise, a bibliometric study of publications from Uppsala University in the period 2002-2006 was carried out by external expertise.

As evident from the present report, the evaluation reveals considerable strengths in many fields and disciplines of the University, and it elucidates areas with potential for future success. It also points at weaknesses and offers advice on actions for successful development. This document serves several purposes, a very important one being realized when it is used as benevolent and qualified advice in the ongoing development of research activities in the various faculties and departments.

I want to express my appreciation for the professional and competent work of the deans, department chairs, faculty members, and others in carrying out the tasks that have been required from them by this evaluation exercise. The commitment to the task of the panel experts, their qualified assessment work and their generous sharing of advice and good ideas is highly valued. Finally, the capabilities and friendliness of my collaborators in the project management and evaluation office have made this work not only doable but also a great and enjoyable experience.

Uppsala October 1, 2007

A handwritten signature in black ink, appearing to read 'Joseph Nordgren', written in a cursive style.

Joseph Nordgren
KoF07 project leader

Executive summary

During the academic year 2006/2007, an evaluation of the research at all faculties of Uppsala University has been carried out in order to assess the quality of research and to identify opportunities for renewal. The evaluation was conducted in a peer-review process, where distinguished scholars of the international research community were engaged in reviewing the research. As a separate exercise, a bibliometric study of research publications for the period 2002-2006 was carried out by external expertise. The peer-review was based on written background material containing self-assessments, documents presenting facts and figures of department activities, and lists of publications. In order to acquire an in-depth opinion about the status and future plans of the various departments, all panels spent a week at Uppsala University conducting site visits, during which they met and interviewed faculty members and Ph.D. students. The review work was distributed on 24 different expert panels with an average of 7 panelists per panel, in total 176 panelists. 11 panels were assigned to Humanities and Social Sciences, 7 panels to Science and Technology, and 6 panels to Medicine and Pharmacy.

Each expert panel had a chairperson who was responsible for the panel work and for the writing of a report summarizing the assessments and conclusions of the panel. Prior to the site visit, the panel chairs were asked to give their viewpoints on the tentative schedule of the site visit proposed by the departments. A staff member of the University administration was assigned to each panel as a panel guide to assist in various matters during the site visit. The panel report, which was written in a format defined by a template, was due in a draft form at the end of the site visit, and at an exit interview on the last day, the main conclusions were presented by the panels to the respective department chairs.

The main objective of the evaluation exercise was to identify strong research activities in specialized areas of expertise as well as in multi-disciplinary constellations and to offer advice on activities with potential to develop into new strong areas of research. Apart from direct research quality assessments, a number of different aspects were asked to be elucidated: (1) Research environment and infrastructure; (2) Networks and collaborations; (3) Opportunities for renewal and emerging science; and (4) Actions for successful development. The evaluation was intended to provide the University management with reliable background material for

the decision-making process for future strategic projects and also to offer departments and faculties support in their quality development work.

Quality assessments were, as far as possible, made in terms of comparing with international standards as known and defined by the panel experts using a set of recommended ratings given in the Terms of reference document: (1) Top-quality or world-leading; (2) Internationally high standard; (3) Internationally recognized standard; and (4) Acceptable standard. Most panels used the recommended ratings, although some panels in the field of Humanities and Social Sciences expressed some difficulties to do so.

Out of the 75 departments and units evaluated the panels identified research activities of the highest quality level, *Top quality or world leading*, in well over 20 departments. These departments are distributed over all three disciplinary areas. The highest quality rating was given to more than 50 specific groups or activities. A few departments as a whole are mentioned to perform at a level no less than *Internationally high standard*. The number of cases for which panels discuss research activities or groups mentioning *Internationally high standard* is about 100. Furthermore, some panels judge research to be of very high quality without explicitly using the recommended quality ratings. The rating *Internationally recognized standard* is found at approximately the same frequency for different research activities throughout the panel reports. Mentioning of research of *Acceptable standard* is found somewhat less abundantly, and in rare cases the panels discuss activities that are assessed not to be quite up to acceptable standard. It should be reiterated here that the main task of the panels was not to grade all research, but to identify particularly strong research, emerging science and opportunities for renewal.

The panels paid attention to the renewal aspect of the evaluation, being aware of the age-heavy demographic profile. They suggest that upcoming retirements be used to strengthen existing, strong efforts or to redirect research. Also, the panel reports often discuss structural conditions and their implications for successful development. Some of these comments refer to issues of a general nature, such as career paths, mobility, opportunities for teachers to do research, mechanisms for funding, etc. Regarding organizational matters comments on sub-critical size and fragmentation as well as potential for more collaboration and lack of strategic planning of research appear in a number of cases. Some panels point out that there is revenue to be collected from optimizing organizations and by increasing collaborations as well as by sharing facilities.

As a separate part of the research evaluation, researchers at Leiden University carried out a bibliometric study on department level of research publications from Uppsala University in the period 2002-2006. The study does not apply to all research since it requires a sufficient number of publication in international journals indexed in the Web of Science databases in order to allow normalized citation scores to be calculated with reasonable accuracy. Therefore, the faculties of Humanities are not included in this study, and for a

number of the departments of the faculty of Social Sciences, the statistical significance of the scores is limited. For most departments in the areas of Science and Technology and Medicine and Pharmacy, where publication practices are more suitable for such analyses, citation scores show statistical significance.

The number of publications in the period 2002-2006 by researchers who were employed at Uppsala University as of September 2006 was almost 20,000. Of these a bit more than 40% are in the Web of Science databases. These articles are to a dominating extent published by scholars in the disciplinary areas of Science and Technology, and Medicine and Pharmacy. Researchers in the Humanities and Social Sciences (including Educational Sciences) on the other hand have larger shares among non Web of Science articles, book chapters, books, edited books, reviews and book reviews.

The number of Web of Science publications was 8,502. These obtained 45,209 citations, self-citations excluded, i.e. on average they were cited 5.32 times. One third of the publications had not been cited at all, while 228 papers belonged to the five per cent most cited papers in their field.

The impact of the research in relation to journal sets was 1.06 for the University as a whole, i.e. Uppsala researchers had a 6% advantage to the world average. Above the University average were Social Sciences (1.25), Mathematics and Computer Science (1.17), Medicine (1.08), Chemistry (1.08), Earth Sciences (1.07) and Engineering (1.07), while Pharmacy (1.05), Biology (1.01) and Physics (0.89) were below.

The impact of the research in relation to the research field(s) was found to be 1.25, a 25% advantage of Uppsala scholars. Above the University average were Biology (1.36), Chemistry (1.35), Engineering (1.35) and Social Sciences (1.26) and below Medicine (1.22), Physics (1.17), Mathematics and Computer Science (1.11), Pharmacy (1.11) and Earth Sciences (0.94).

The bibliometric study also shows that Uppsala scholars on average publish in journals that have an impact that is 17% above the world-average. Again there were variations between fields in the University. Above the total average were Biology (1.35), Physics (1.32), Engineering (1.26), and Chemistry (1.25), and below Medicine (1.13), Pharmacy (1.06), Social Sciences (1.01), Mathematics and Computer Science (0.95) and Earth Sciences (0.88).

It could be noted that the University of Leiden team that conducted the study found that Uppsala researchers are well connected to high quality research groups. They state that users of UU knowledge tend to be cited highly themselves, which indicates that UU work is used by researchers of high impact, at the edge of the research frontier.

Part I:
The Project

1. Introduction

In the post-war period, research and higher education have become increasingly significant activities all over the world. They are often seen as a means to achieve economic growth and prosperity. As a result, the number of institutions for research and higher education as well as the number of researchers and students has increased considerably. This in turn has made resource allocation more complicated and in many countries led to efforts to evaluate research and higher education (see e.g. Geuna 1999, Martin and Geuna 2003, OECD 1997). In some countries, like the United Kingdom, this has led to a relatively elaborate system for evaluating the standards of research and higher education (see e.g. Curran 2000 and Elton 2000).

In Sweden, evaluations of research started out in the late 1970s as the Council for Research in the Natural Science (NFR) started evaluations of the various disciplines under their jurisdiction (see Government Bill 1981/82, p. 37 and NFR 1981). They were followed by similar evaluations within the other research councils. The Council for Research in the Humanities and Social Sciences (HSFR), for instance, undertook evaluations of economics (Engwall 1992), history (Danielsen *et al.* 1988) and sociology (Allardt, Lysgaard and Bøttger Sørensen 1988). These evaluations by the councils for research have continued ever since. However, they have not had any direct links to funding of research.

Since the early 1990s, universities and university colleges have also been subject to evaluations by a central body, first the Office of the University Chancellor (*Kanslersämbetet*) and later in 1995 the National Agency for Higher Education (*Högskoleverket*). The former organization was evaluating the procedures for quality improvement, while the latter focussed on the quality in various disciplines. Although, the quality evaluations were primarily directed towards the educational programmes, the reports from them touched upon the quality of research.

In addition to these national initiatives, local evaluations of research in order to reallocate resources within individual universities have been undertaken, such as the BASTU project at Uppsala University (see e.g. SAUNA IV).

In the same spirit, Vice-Chancellor Professor Anders Hallberg announced an overall evaluation of the research within Uppsala University as he took office in the summer of 2006. He thus proposed to the University Board to launch the project *Quality and Renewal 2007* (Kvalitet och Förnyelse 2007 or in short KoF07). The University Board decided to go ahead with the evaluation

following the plans outlined in a presentation by the proposed project leader, Professor Joseph Nordgren, on October 26, 2006.

The KoF07 evaluation aims at probing the international standing of research at all faculties in order to identify strong activities and opportunities for renewal. The evaluation has engaged a large number of distinguished scholars from many different countries, and it has put considerable weight on the site visits. It includes an advanced bibliometric study that has been carried out as a separate exercise independent from the assessment based on written documents and site visits. The KoF07 evaluation thus represents a new way of evaluating academic research in Sweden.

The main part of the present report comprises the panel reports that were produced after the site visits. However, before turning to these, the report will put the evaluation in context by briefly summarizing the Swedish system of research and some characteristics of Uppsala University. In addition, the project design is described, and some observations from the panel reports are presented and discussed. A summary of the bibliometric study is presented in Chapter 5. The full bibliometric report appears in Part IV.

2. The Context of KoF07

2.1 The Swedish system in brief

The Swedish system for research can be said to be based on the Humboldt principle that research and higher education should go hand in hand. The number of research institutes is therefore very limited and the research which is not pursued by industry is concentrated to universities and university colleges. There are 16 institutions with university status and 16 university colleges. Of the former, Uppsala University and Lund University are the oldest founded in 1477 and 1668, respectively. In the late nineteenth century, they were followed by the ones in Stockholm (1878) and Gothenburg (1891), and in the twentieth century an additional six universities were added (Umeå, Linköping, Karlstad, Mid-University, Växjö and Örebro). Furthermore, there are six stand-alone institutions with university status: three institutes of technology, a medical school, a business school and a university of agriculture and forestry. Most of the mentioned institutions are public. The three exceptions are Chalmers Institute of Technology in Gothenburg, the Stockholm School of Economics and the Jönköping University College (see further Engwall and Nybom 2007).

The funding of academic research in Sweden in 2005 amounted to about € 2 billion, of which almost half was allocated to science and technology and almost one third to medicine. The government funding, which accounted for 75% of the total budget, was distributed as direct government grants and through project grants (see Figure 2.1). In addition, there were non-government funding through various foundations and other sources. Almost half of the funding (47%) was direct government grants. 26% came from government authorities and research councils, while the remaining funding (27%) arose from private foundations, foreign sources (mainly the European Union), corporations, public research foundations, etc.

In terms of the discussion in the field of sociology of science (see Gibbons *et al.* 1994; Nowotny *et al.* 2001; Slaughter *et al.* 1997), the research funding in Sweden can be characterized as a mix of Mode I and Mode II. Mode I represents academic, investigator-initiated and discipline-based research, while Mode II is context-driven, problem-focused and interdisciplinary knowledge production. The latter is indeed penetrating to a considerable extent. Three signs of this can be seen. First, politicians often use utilitarian arguments for spending funds on research. Second, a number of utilitarian oriented funding bodies have been founded. Third, for some time there has been a demand from government on researchers to communicate their results to the general

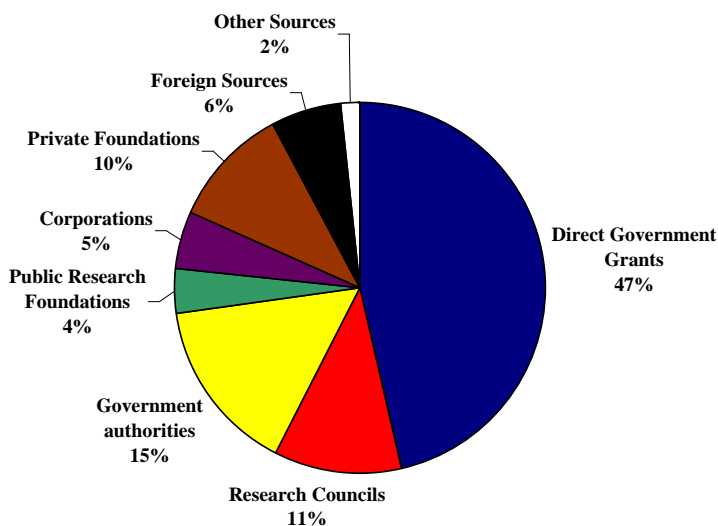


Figure 2.1: Sources of research funding in Sweden 2005 (Total Funds \sim € 2 billion). Source: Statistics Sweden. Research and Experimental Development in the Higher Education Sector 2005 (UF13SM0601)

public. However, at the same time Mode I is still significant. The evaluation of research is one indication of this. Another is the increasing use of citations and journal impact factors as indicators of research quality. Finally, it is clear that recruitment decisions are primarily based on scientific performance, although teaching performance and other criteria are nowadays taken more into consideration than earlier.

In terms of recruiting, it is important to note that the Swedish procedures for recruitment differ somewhat from those of other countries, particularly the United States. First of all, there is no tenure track system. Instead there is a double career system with one track (tenured lecturers), primarily directed towards teaching, and another track (non-tenured post-doctoral positions for four years and tenured chairs) with research and teaching. Along the first track, lecturers may apply for promotion to professor when they have reached the qualifications to hold a chair. The promotion does not automatically give research time, however. Instead lecturers and promoted professors are supposed to apply for research funding through the different funding bodies mentioned above. It should also be kept in mind that departments are not expected to take an active role in the selection among applicants for academic positions. Appointments are primarily bureaucratic procedures based on the evaluation by external experts.

The trends for the basic research funding has been that the government has moved from a system with very specified direct grants to one in which the direct grants are less specified but decreasing relatively. At the same time, there has been an increase in project grants. This started out in the 1940s as Councils for Research began to arise. In the beginning of the twenty-first century, these research councils were merged into one body, the Swedish Research Council (*Vetenskapsrådet*). In addition to this organisation, there are a number of other bodies financing research as mentioned above. A trend in recent years has been that they all have the ambition to go for larger and longer-term grants through the selection of “Centres of Excellence”, “Strong Research Environments” etc., sometimes requiring concerted efforts by a number of different research groups and the proposal endorsed or even signed by the university management. An issue of conflict in project funding, particularly with private foundations, has concerned overheads.

To sum up, Uppsala University is one of 16 Swedish institutions with university status. It is acting in a system in which academic teaching and research are kept together and in which three fourth of the funding for research is coming from government. An increasing part of these resources is distributed after project applications, especially for Science and Medicine research. Recently, funding bodies have tended to concentrate resources through the provision of larger grants.

2.2 Uppsala University in brief

Being the oldest university in Northern Europe, Uppsala University has long traditions and has played an important role in the higher education and research in Sweden. At its foundation in 1477, the teaching of the University was directed towards philosophy, law and theology. Teaching lasted a few decades into the sixteenth century, but ceased for most of the remaining part of the century. In the seventeenth century, donations from the then King, Gustavus (II) Adolphus, provided improved conditions for the University and a renewal occurred, particularly marked by activities in medicine and the natural sciences by professors like Olof Rudbeck. In the early decades of the eighteenth century, the natural sciences became even stronger with subsequently well-known professors such as Torbern Bergman, Anders Celsius and Carl von Linné. In the early nineteenth century, this epoch was followed by an increased emphasis on the humanities, and in the latter part of the century, by expansion in medicine and the natural sciences. In this period, several new institutions were created: the Observatory (1853), the Chemical Laboratories (1859), the Hospital (1867) and the University Building (1887). The number of students was still rather small (1,500 in 1870), and it was not until after Second World War that a real growth was seen. In 1960, the number of students was 8,000, and in 1970, it was 21,000. Presently, there are 40,000 undergraduate students

and 2,500 graduate students. At the same time, the different disciplines in the University have developed considerably and a number of new disciplines have been introduced. It is therefore fair to say in relation to this expansion as well as to the above condensed history of the University that, over its long time of existence, it has been subject to considerable change and renewal. KoF07 should therefore be seen in this historical context. (See further Lindroth, 1976 and Annerstedt).

In terms of the present organization of the university, its top management consists of the Vice-Chancellor, the Deputy Vice-Chancellor and the University Director. The first two have been selected involving a collegial process within the University, while the recruitment of the University Director is more of a labour market process. The Government appoints the Vice-Chancellor after a proposal from the University. The Deputy Vice-Chancellor and the University Director, on the other hand, are appointed by the University Board (*Konsistoriet*). The latter presently has a majority of Government-appointed members, eight persons, while faculty members are represented by four, among them the Vice-Chancellor, and the students by three persons. In addition, representatives of the three labour unions have the right to be present and to speak.

The chairperson of the board used to be the Vice-Chancellor, but this system was changed in 1998 when the then Social Democratic Government decided to appoint external individuals as chairpersons (see further Engwall, 2007). Since a new Government has taken office in the fall of 2006, universities and university colleges have obtained the freedom to select board members themselves and to have these selections confirmed by the Government.

In addition to the Board, the Vice-Chancellor, the Deputy Vice-Chancellor and the University Director, Uppsala University has had three Vice-Rectors for almost ten years. They are elected among peers and have the responsibility for the disciplinary domains of 1. Humanities and Social Sciences (Faculties of Theology, Law, Languages, Arts and Social Sciences), 2. Medicine and Pharmacy, and 3. Science and Technology. In addition, the Dean for Educational Sciences is a member of the top management team of the University. All in all the University contains nine faculties and about 70 departments. They have together about 6,000 employees, of which 500 (8%) are professors and an additional 2,000 (55%) are involved in teaching and research.

The total annual budget of the University presently is € 425 million, of which 60% is allocated to research and graduate education. The € 170 million allocated to undergraduate education is spent on delivering an average of 21,000 FTE (*full time student equivalents*) per year within some 35 programmes for beginners, about 45 master programmes, and close to 2,000 single-subject courses. The € 255 million for research and graduate education, in turn, annually results in about 5,000 academic publications and some 400 doctoral exams. In order to stimulate quality in education and research,

the University has student exchanges with nearly 500 universities and approximately 3,000 international research collaborations throughout the world.

Uppsala University can thus be said to have long traditions and over the centuries has undergone many transitions and changes. From a small institution primarily focusing on philosophy, theology and law, it is today a multidisciplinary organisation with a considerable number of students and employees. It is producing a substantial number of graduates and research publications through extensive international collaborations.

2.3 Bibliography

Allardt, E., S. Lysgaard and A. Bøttger Sørensen, 1988, *Sociologin i Sverige* (Sociology in Sweden), Uppsala: Swedish Science Press.

Annerstedt, C., 1877-1913, *Uppsala universitets historia 1-3*, Uppsala: Uppsala universitet.

Curran, P. J., 2000, "Competition in UK Higher Education: Competitive Advantage in the Research Assessment Exercise and Porter's Diamond Model", *Higher Education Quarterly*, 54: 386-410.

Danielsen, R. et al., 1988, *Six perspektiv på historisk forskning* (Six Perspectives on Historical Research), Uppsala: Swedish Science Press.

Elton, L. 2000, "The UK Research Assessment Exercise: Unintended Consequences", *Higher Education Quarterly*, 54: 274-283.

Engwall, L. 1992, *Economics in Sweden*, 1992, London: Routledge.

Engwall, L. and T. Nybom, 2007, "The Visible Hand Leaving Decisions to the Invisible Hand. Allocation of Research Resources in Swedish Universities", in Richard Whitley (ed.), *The Changing Governance of the Sciences. The Advent of Research Evaluation Systems*, Berlin: Springer.

Engwall, L., 2007, "The Universities, the State and the Market. Changing Patterns of University Governance", *Higher Education and Policy*, 19, No. 3 (forthcoming).

Geuna, A., 1999, *The Economics of Knowledge Production: Funding and the Structure of University Research*, Cheltenham: Edward Elgar.

Gibbons, M., C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, and M. Trow, 1994, *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, London: Sage.

Government Bill 1981/82:106, *Regeringens proposition om forskning* (Government Bill on Research), Stockholm: Fritzes.

Lindroth, S., 1976, *A History of Uppsala University 1477-1977*, Uppsala: Uppsala University.

Martin, B. and A. Geuna, 2003, "University Research Evaluation and Funding: An International Comparison," *Minerva*, 41: 277-304.

NFR, 1981, "International Evaluations of Research Projects Supported by the Swedish Natural Science Research Council. Summary of Reports, Achievements and Criticisms, 1977-1980", Stockholm: Swedish Natural Science Research Council.

Nowotny, H., P. Scott and M. Gibbons (2001), *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty*, Cambridge, UK: Polity Press.

OECD, 1997, *The Evaluation of Scientific Research: Selected Experiences*, Paris: OECD.

SAUNA IV, 2001, *Rektors förslag till förnyelse och fördelning av BASTU-medel*, Uppsala: Uppsala universitet.

Slaughter, S and L. L. Leslie, 1997, *Academic Capitalism: Politics, Policies and the Entrepreneurial University*, Baltimore: Johns Hopkins University Press.

3. The KoF07 Project

3.1 Introduction

The primary goal of KoF07 was to identify strong areas of research and successful research constellations at Uppsala University. Furthermore, it aimed at finding emerging science and identifying opportunities for new research by probing the standing of research at Uppsala University in national and international perspectives. The evaluation was not primarily aiming at comparing different disciplines within the University.

The evaluation was set to provide means to strengthen the quality of the scientific activities by offering reliable background material for the decision-making process for future strategic projects. It would also offer departments and faculties support in their own work on formulating plans for future research. Probing renewal and innovation in academic research is generally more difficult than assessing past performance. It is, however, a most important task, not least since numerous retirements of senior researchers are foreseen in the years to come. The results of the assessments of the expert panels on opportunities for renewal are therefore expected to be of vital importance for the strategic planning of research at the departments. It will offer departments and faculties support in their work to continue to encourage, develop and provide backing for good research.

There was a wish from the university management for the evaluation not to extend into the fall semester of 2007, which called for both a quick start of the project and a high pace of progress. As can be seen from Figure 3.1, the project started in mid-September 2006 and was given about a year to be accomplished. In the following subsections, the different steps, shown in Figure 3.1, will be described in further detail.

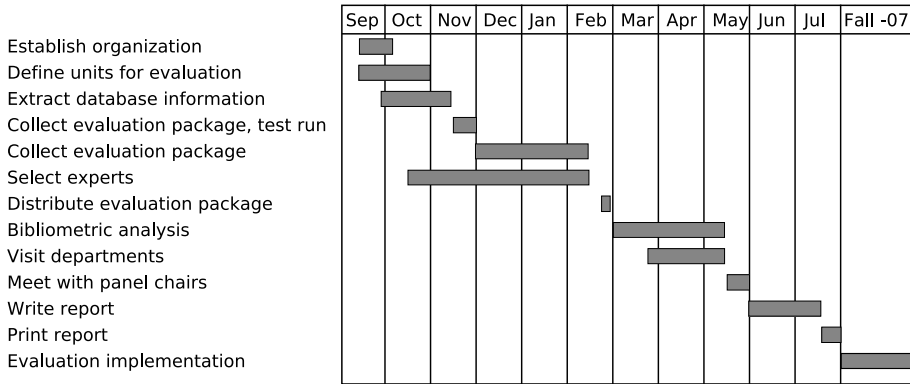


Figure 3.1: Time Schedule

3.2 Project organization

3.2.1 Project management

As mentioned above, the project was launched by the Board of Uppsala University and the Vice-Chancellor (see Figure 3.2). It was managed by a *project management* team with the following members:

- Project leader: Professor Joseph Nordgren, Department of Physics
- Deputy project leaders: Professor Lars Engwall, Department of Business Studies
 Professor Anne-Sofie Gräslund, Department of Archeology
- Evaluation office: Mr. Per Andersson, MSc, University Administration
 Dr. Maivor Sjölund, Unit of Quality Assessment
 Dr. Marcus Agåker, Department of Physics

The work was monitored by a *reference group* consisting of the heads of the three disciplinary fields (the Vice-Rectors), the Dean of Educational Sciences, the Head of the Unit for Quality Assessment, and a research student representative. The members of this group were:

- Professor Lars Magnusson, Vice-Rector Humanities and Social Sciences
 Professor Jan-Otto Carlsson, Vice-Rector Technical and Natural Sciences
 Professor Ulf Pettersson, Vice-Rector Medical and Pharmaceutical Sciences
 Professor Caroline Liberg, Dean Educational Sciences
 Associate Professor Annika Lundmark, Head Unit of Quality Assessment
 Mr. Mattias Wiggberg, Ph.D. student, Department of Information Technology

The project team was supported for the *external panel visit administration* by Academic Conferences (*Akademikonferens*), a joint organization between Uppsala University and the Swedish University of Agricultural Sciences. In addition, the University administration provided research secretaries who accompanied the different expert panels during the visits at the departments.

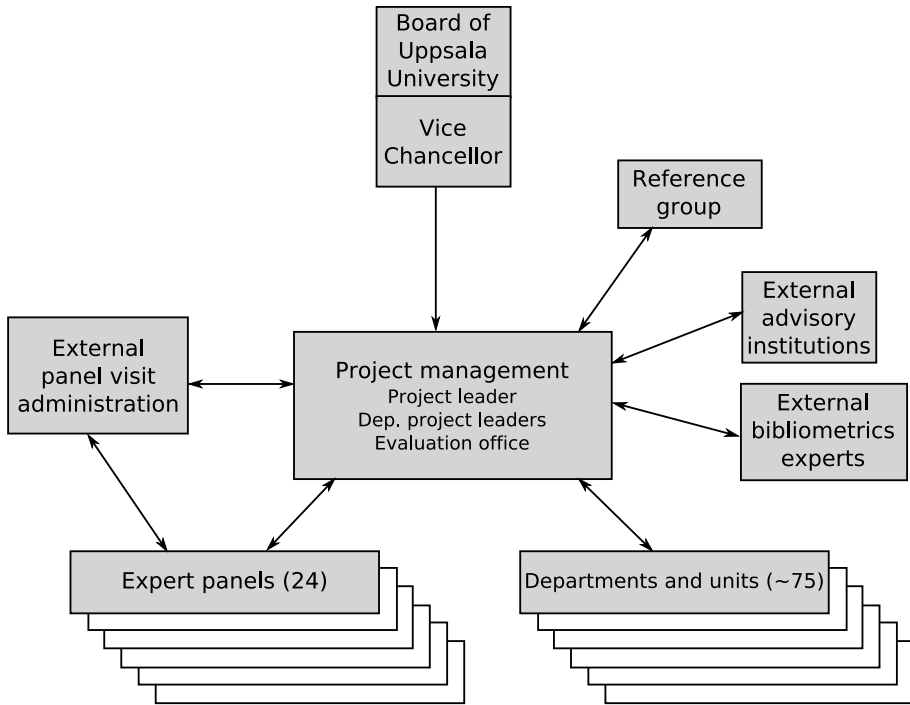


Figure 3.2: Project Organization

External bibliometrics experts were engaged to carry out a bibliometric study of Uppsala University research publications in the last five-year period, namely the CWST of Leiden University in the Netherlands. In addition, advice has been sought from *external advisory institutions*. Informal contacts with them have aided in some stages of the project. The experiences from the research assessment at Helsinki University in 2005 have been particularly useful.

The objects of the evaluation have been about 75 *departments and units*. These have been evaluated by 24 *expert panels*. The latter have been recruited internationally but have all contained one Swede in order to provide knowledge about the Swedish system. The size of the panels varied (see further below).

3.2.2 Method of evaluation

The main point of the evaluation was conducted in a peer-review process, where distinguished scholars of the international research community were engaged in reviewing the research. As a separate exercise a bibliometric study of research publications for the period 2002-2006 was carried out by external expertise. The peer-review was made by eminent scholars of the international research community who reviewed the departments during a one-week site

visit at Uppsala. In preparation for the visit they studied a written background material provided by the various departments. The background material contained self-assessment documents, facts and figures of department activities, and lists of publications. The extended site visits were considered necessary in order to acquire an in-depth opinion about the status and future plans of the various departments and research groups. The review work was distributed on 24 different expert panels with an average of seven panelists in each panel, in total 176 panelists. 11 panels were assigned to Humanities and Social Sciences, 7 panels to Science and Technology, and 6 panels to Medicine and Pharmacy.

As a separate exercise, a bibliometric study of research publications in the period 2002-2006 was carried out by external expertise. The result of the bibliometric study was not made available to the panels. It was instead the intention to get an independent comparison of the quality ratings as represented by the two different methods. In addition, the trust in the validity and applicability of bibliometry varies between disciplinary areas, which was another argument for separating the two different kinds of evaluation.

Each expert panel had a chairperson who was responsible for the panel work and for the writing of a report summarizing the assessments and conclusions of the panel. Prior to the visit, the panel chairs were asked to give their viewpoints on the tentative schedule of the site visit proposed by the departments. A staff member of the University administration was assigned to each panel as a panel guide to assist in various matters during the site visit. A panel report was written in a format defined by a template, and the main conclusions were presented by the panels to the respective department chairs at an exit interview on the last day.

3.2.3 Project portal

The project used an internet portal in order to collect and distribute information to departments and panel experts, as well as providing a means to host an evaluation specific webpage. The portal tool used was Designtech's Project-Coordinator® X [www.designtech.se]. This is a project coordination tool specially developed to handle large projects with many collaborators located at geographically dispersed sites. There are tools for webpage design, document management with version handling, drag and drop features, project planning, calendar, Gantt reports, user grouping, simple e-mailing systems etc. The portal operates through a web based interface where a login page, with the option to have a more extensive public webpage, gives access to a secure environment on a server where documents and other information can be stored and accessed. The secure part of the portal consists of an internal homepage (optional) and a working mode where the different portal tools and document archive can be accessed.

During KoF07 primarily the planning tool, the document management and the web page tool were used. A public webpage provided general information about the project such as a general description of the evaluation process, the time plan and project organization, department division on panels etc. These pages were quite static during the evaluation process and only minor adjustment of this information was made. One page, specifying the panel members, was added once these were selected.

An internal page provided specific information and instructions as well as links to downloadable documents. Here, a progress report was given informing about the status of the evaluation. These pages were subject to changes during the evaluation process to fit the needs of the current stage. The primary changes were made in the transition from the department self evaluation submission phase to the panel member access phase. During the department self evaluation phase, each of the department chairs was assigned a user with the privilege to upload the self evaluation documents to the portal. New versions of the documents submitted at a later stage were handled by the portal's internal version handling system so that it was always the latest version that was available in the archive. The self evaluations were then linked to specific panel pages as they were without editing. In the second phase, panel members were assigned users to access the portal and the self evaluation documents. Other documents like *Terms of reference* and a *Panel report template* were provided on these pages (see further below). Panel chairs could access the working mode of the portal to allow uploading of documents, which was not used to a large extent, though. The other panel members could only access the internal home page and take part of the information provided there and access the documents through the links.

The project portal offered an efficient means to collect and distribute information and documents. It facilitated the work of the panelists in terms of reading background material as this was available from any location with internet access.

3.3 Defining units for evaluation

The basic unit for evaluation was a department, as the department is the legal unit in the university organization and thus suitable for handling the various phases of the evaluation process. A formal decision structure is needed, since formulating a condensed written material that describes the research profile of a department may require elements of negotiation as a department comprises several quite independent research groups. In several cases, the research profile of a department turns out to be too scattered in terms of its research profile to make a department unit a suitable choice. Instead, subsections of some departments have been grouped together with other departments or subsections of departments to form suitable clusters of units for evaluation by a certain

expert panel. In other cases where departments are more homogeneous even several departments have been grouped together in a cluster suitable for evaluation by one panel. A number of cross-disciplinary centers without department status have also been evaluated as separate units.

Appendix A presents the distribution of departments, parts of departments and centers on the 24 different panels.

3.4 Evaluation package

The evaluation was designed to optimize the relation between information value and work load for the departments, and to provide a condensed and informative background material for the panelists prior to the site visits. In particular, it was designed to stimulate a process where faculty at the departments would work together to arrive at a common description of ongoing research at the department, as well as to formulate visions for the future. It is envisaged that this very process in itself would be a beneficial component in the quality development work.

Three sets of documents were prepared and provided to the panelists: (1) a self-assessment exercise; (2) a document presenting a number of quantified quality factors; and (3) a document presenting facts and figures. The forms of these documents can be found in Appendix B.

3.4.1 Document A: Self-assessment

The first document comprised a written description of ongoing research activities and plans and visions for the future, as a self-assessment by the departments. In order to achieve condensed written material, the amount of text was limited in proportion to the number of full time equivalent (FTE) researchers, so that, for instance, a department of 100 FTE researchers could use 36,000 characters in total and list maximum 30 publications that particularly well represented the research described. In addition, the entire publication list was available to the panels through the internal database OPUS.

3.4.2 Document B: Quantified quality factors

The second document contained an account for achievements, assignments and other factors that can be assumed to express a degree of quality. Furthermore, these factors are accounted for in terms of frequencies, so that, for instance, the number of plenary talks at international conferences is stated. The detailed lists are not given, but could be asked for by the panels. Even though each individual factor (or indicator) should not be ascribed very high importance, the over-all picture may provide some hints to the quality level of the research at a department.

3.4.3 Document C: Departments - facts and figures

The contents of the third document were extracted from the common databases at the university. It offered a brief account of the situation at the departments with respect to staff, research exams, publication rates and economic conditions.

Number of staff was given in terms of full time equivalents (FTE) for the categories chair professor, promoted professor, associated professor (*docent*), postdoctoral staff, doctoral student and other personnel. Information about the fraction of research staff was also provided. Total number of employees at the departments was presented as well as average age and percentage of females for the different categories of staff. All figures were given as of September 2006 and for comparison also as of September 2001.

The account for *research exams* concerned Ph.D. and Licentiate exams per year for the periods 1995-2000 and 2001-2006. Fraction of female, age at examination and net study time were also presented.

The *publication rates* at the departments were provided with a division into different categories, i.e. monographs, journal articles, conference proceedings, etc. Figures for the years 2001 to 2006 were presented.

The *economic conditions* of the departments were presented in terms of total revenues, total costs and revenues for a few major categories like undergraduate teaching, direct funding of research and research education, and external funding for research. Figures for 2006 were provided with figures for 2001 for comparison.

3.4.4 Terms of reference

The anatomy of the KoF07 research evaluation is described in the *Terms of reference* document (see Appendix C). It was used as a steering document for the expert panels. The document was supposed to be read together with the documents *Evaluation documents A, B and C* (Appendix B) and *Instructions to Departments for the planning of panel site visits* (Appendix G).

The *Terms of reference* document gave a background to the evaluation exercise and stated the objectives and described the method adopted. It furthermore presented evaluation criteria and recommended mode of work of the panels. The quality ratings to be used in the document were defined in terms of relative standing with respect to international standard, and recommended ratings were *Top quality or world leading; Internationally high standard; Internationally recognized standard; Acceptable standard*. The application of the quality ratings was to a high degree based on the knowledge and definitions of international standings of the panel experts, as they were experienced evaluators at the international level. As the main objective of the evaluation was to identify strong research and interesting opportunities for renewal, it was not mandatory to grade all research, although the panels were asked to comment on actions for development. They were asked to address activities

with clear potential for improvement. As the unit of evaluation was department rather than individuals, the panels were asked to qualify the extent of activities in the respective rating.

The document also described the working arrangements of the expert panels, the particular responsibilities of the chair and other matters of importance for the evaluation task.

3.4.5 Panel report template

A template for the individual panel reports was provided in order to achieve a sufficient degree of conformity between the different panel reports, and to make sure that the most important set of questions was addressed by the panels (Appendix D). The items that the panels were asked to comment on were:

- General assessment of the department/unit
- Quality of research
- Research environment and infrastructure
- Networks and collaborations
- Opportunities for renewal and emerging science
- Actions for successful development
- Other issues

The panels were also asked to comment on other issues that they considered of importance for the quality work at the University.

3.5 Selecting experts

The strategy for the recruitment of the expert panels was to have a number of all-international panelists complemented with one member from another Swedish university than Uppsala, preferably from a research field adjacent to the central field of the panel. The panel chair should be a very well recognized generalist researcher with high degree of integrity and experience.

The assignment of expert evaluators for academic research is a delicate task in the sense that panelists should have a high degree of competence and skills along with integrity, and trust by the researchers to be evaluated. Therefore, the procedure to select experts needed support among faculty members and still resist claims of challenging issues. The method adopted worked through invitations from deans to departments to nominate evaluators according to a search profile. The nominees were screened by the project management with respect to challenge issues, and in only a few cases, nominees were found to be disqualified due to too close associations. A document defining the specified requirements for scholars to be nominated is found in Appendix E.

To cover the various research directions and special fields represented by the departments and groups assigned to a particular expert panel between 5 and 11 panelists were engaged in each of the 24 different panels. In total,

there were 176 panelists engaged in the evaluation. The time schedule for the evaluation project required that experts be assigned only a few months before the site visits. The over-all acceptance rate for invited panelists was 47% and for panel chairs 35%. Variations between panels were considerable. For one panel all the original candidates accepted, while another one had only an acceptance rate of 30%. The rate decreased with time to the approaching site visits. It can be noted that the acceptance rate for women was lower in the case of chair assignment and as Swedish panelist. The selected panel experts are presented in Appendix F.

3.6 Site visits

In order to assess strengths and weaknesses, and in particular potential strengths and weaknesses, it was considered a vital ingredient in the evaluation to allow panel experts to devote enough time to department visits. Therefore, an extended site visit was planned, also since it was planned for the panels to write their report during the visit. In general, the panels submitted a draft report before leaving, and the final report was delivered two weeks after the visit.

Each of the 24 different expert panels paid a one-week visit to Uppsala University, with five working days except the arrival day (see Appendix H). The visits were organized in three different work weeks, March 26-30, April 23-27, and May 7-11. A preparatory meeting with the panel chairs and the Swedish panelists was held on the evening of the arrival day, Sunday, before a reception dinner with all panelists. This meeting allowed the evaluation management to introduce the chairs to their role as leaders in the evaluation process, as well as to offer the chairs a possibility to ask questions and to be updated on new information.

For the panel members, the site visit started on Monday morning with an introduction to the evaluation process and a guided tour of the University Museum in Gustavianum. After lunch, presentations of the faculties were given by the deans, and the panels were given time to plan their visits during the week. At this internal meeting of the panels, the panel guide from the university administration was present.

Tuesday, Wednesday and Thursday were devoted to department visits and internal panel meetings. After 3 p.m. the panels held internal meetings at a department or at the hotel. The detailed time schedules for department visits were worked out by the departments in communication with the respective panel chair.

The last day of the visit included a final internal meeting of the panel to finish the draft of the panel report. In the last part of the meeting, department chairs and deans were invited to an exit interview, where the panel chair gave

a summary of the findings, conclusions and recommendations of the panel. The site visit was concluded after a common lunch with deans and chairs.

3.7 Meeting with panel chairs

A separate meeting with all the panel chairs was organized immediately after the last week of site visits. The meeting was held at a conference facility in the small town of Sigtuna between Uppsala and Stockholm. The University management was invited to this meeting as well as the faculty and section deans. The objective was to bring up issues of multi-disciplinary and cross-faculty nature that might not have been attended to in a satisfactory way and also to offer a further opportunity for the deans to discuss with the panel chairs about matters relevant to their respective areas.

3.8 Bibliometric study

As a separate part of the research evaluation, a bibliometric study of research publications from Uppsala University in the period 2002-2006 was undertaken. The study was carried out by external expertise, the CWTS at Leiden University. The expert panels were not provided with the results of this study, and in fact the study was mainly conducted after the submission of the panel reports.

The separation of the bibliometric exercise from the peer-review evaluation was deliberately chosen in order not to bias the assessment work of the panels. Furthermore, the validity of bibliometry is varying among the different disciplinary areas of research, owing to the varying publication traditions. In this discussion there is no disagreement that the output of publications constitutes a reasonable measure of performance. The differences in points of view concern the channels for publications, and how these differences should be handled. While journal articles in English constitute the main form of publication in the natural science and medicine, articles and books in other languages than English are a common form of dissemination of ideas among scholars in the humanities and in several fields of the social sciences.

Particularly for science and medicine, the significance of journal publication has increased successively since the 1950s through the development of bibliometrics, which has implied that journal impact is constantly evaluated through the citation behaviour of scholars. This in turn has implied that bibliometrics are used to evaluate individual scholars and research groups, and it has also become a key element in various rankings of universities that are becoming more common.

The results of the bibliometric study are presented in Part IV of this report after the panel reports.

Part II:

Summary of the results

4. Expert panel evaluation

In the following a summary of the results of the evaluation is presented. It has to be underscored that this summary by necessity cannot express the views of the evaluating panels in full. Although the authors have tried their best to make short, representative summaries, the manner in which pieces of information from the panel reports have been selected may still contribute somewhat to the overall impression. It is therefore very important to go to the panel reports for the full picture. The panel reports are presented in full in Part III of this document.

4.1 General observations

4.1.1 Introduction

The main charge to the panels was to identify strong research and opportunities for renewal, and to a high degree, they have delivered the information sought after. They find more than 50 research activities that they give the highest quality rating. These are found in over 20 departments distributed over the three disciplinary areas, Humanities and Social Sciences (HS below), Science and Technology (ST below), and Medicine and Pharmacy (MP below). A few departments as a whole are mentioned to perform at a level no less than *Internationally high standard*. The number of cases when panels discuss research activities or groups mentioning *Internationally high standard* approaches 100. Furthermore, some panels judge research to be of very high quality without explicitly using the recommended quality ratings. The rating *Internationally recognized standard* is found at approximately the same frequency throughout the panel reports. Mentioning of research of *Acceptable standard* is found less abundantly, and in rare cases the panels discuss activities that are assessed not be quite up to acceptable standard. It should be reiterated here that the main task of the panels was not to grade all research, but to identify particularly strong research, emerging science and opportunities for renewal.

It has to be noted that the panel reports vary in terms of the attitude of the panels towards grading the evaluated departments. Some are very clear on giving grades to departments and research groups, while others provide more general assessments. A few panels within the Humanities and the Social Sciences have been particularly hesitant to use grades, and have found difficulties

in applying the recommended quality ratings. As pointed out by one panel in the Humanities:

The proposed expressions for the quality rating of originality and significance given in the document 'Terms of reference for expert panels' are not particularly well suited for the assessment regarding the disciplines [covered by our panel]. This goes particularly for the category mentioning 'world-leading research'. (HS Panel)

Panels in the Humanities consider too much to be published in Swedish and encourage transfer to international and even electronic publishing. For instance:

We found a rather high degree of internal publishing to be the custom in many units. While we do not wish to dispute the relative, and in some cases absolute, merit of in-house (i.e. Uppsala University) series and journals, we do think that it would be good policy to encourage a higher degree of internationally competitive publication with outside publishers. (HS panel)

It is no doubt imperative to keep the national language in constant use in academic writing, to ensure a state-of-the-art level for Swedish terminology in the disciplines involved. But a great deal of scholarly and scientific findings needs to reach the larger international scholarly community. Reasons for this cut both ways, i.e., they demand controllability and they demand diffusion. It seems to the panel that parts of Uppsala University have not adopted concerted measures to ensure or even encourage the use of more widely spread languages in presenting its scholarship to the world. Procedures for stimulating publication in non-Swedish languages seem to vary from unit to unit. (HS Panel)

In the introductory presentations before the site visits, the task of identifying strong research was sometimes described in terms of finding "golden nuggets". In some cases panels have explicitly mentioned "golden nuggets" in their reports, and it is then often a combined assessment of high quality, potential for successful development, and even other aspects, such as niche-like conditions.

The panels paid considerable attention to the renewal aspect of the evaluation. They are well aware of the almost ubiquitous, age-heavy demographic profile, and they often choose to see this as an opportunity for renewal. Thus, in many cases they suggest that upcoming retirements be used to strengthen existing efforts or to redirect research. Also, the panel reports often discuss structural conditions and their implications for development of successful research. For some departments, there are frequent mentioning of words like sub-critical size and fragmentation in this context as well as a need for more collaboration and lack of strategic planning of research. In a number of cases

the panels address questions regarding career opportunities and tenure track; incentives for course development; distribution of teaching load. One panel points out:

The very high teaching load of the tenured personnel should be lowered. Such teaching load must be among the highest in the world. We suggest that the teaching load should never exceed 67% on the average for all tenured researchers [...] When the output or production is nevertheless high, we suppose that many researchers are adding substantial personal free time to their paid job. (HS panel)

Some panels submitted their reports before their departure from Uppsala, although most used the option to get another two weeks for additional editing. Each department was given an opportunity to comment on its report, and this led to minor revisions with respect to factual errors or misunderstandings.

Not astonishingly, the reports vary in their characteristics. They vary in size and in terms of contents. As far as the size is concerned, the average report contained 33,300 characters, the shortest 11,300 characters and the longest 77,800 characters. Averages vary somewhat between the areas of research: 31,500 for the Humanities and Social Sciences, 35,100 for Medicine and Pharmacy and 38,600 for Science and Technology. To a limited extent the length of the reports correlates with the size of the evaluated groups.

Discussions with panel members revealed some difficulties on their part to understand the institutional setting of the Swedish system, particularly the procedures for recruitment and funding. This was reinforced by the fact that translations of titles vary among and even within departments. The panel reports reveal a number of critical remarks on conditions governing the university system as they appear at Uppsala University, although they are likely to be relevant also for other universities in Sweden. These will of course provide important information for the relevant research groups and their leaders in the university hierarchy. In the following, a number of remarks of a general character are brought up to illustrate this discussion. They can be divided into three groups.

- Recruiting
- Funding
- Organizing

4.1.2 Recruiting

A common theme dominating the reports is a concern regarding the possibilities to recruit a new generation of well-qualified scholars. Many panels have noted that Uppsala University is facing a *change of generations*:

The demographic profile presents a problem in that many of the most significant researchers will retire within the next few years. (HS Panel)

The leading professor plays a dominant role in the management of the group. This is a risk. Given that he is to retire shortly, a succession plan is needed to assure the continuation and the strategic development of the group. (MP Panel)

A few exceptions to this state of affairs can be mentioned, however:

The staff is well balanced with respect to age, experience and research interests [...] The work of senior scholars is well complemented by the work of young devoted researchers. (HS panel)

The age distribution of the scientists is well balanced between senior expertise, driving mid-career persons and young promising talents to develop. (ST Panel)

Many of the panels that point out *the need to recruit successors* to the retired researchers stress the need to plan for this transition. They recommend the University to be very proactive in this process:

Plans for long term renewal beyond the next five years need to be developed. (HS Panel)

this opportunity requires strategic, rather than uncoordinated, hiring and a critical analysis [...]. (ST Panel)

The panel recommends that retirements should be anticipated well ahead of the time of retirement, such that a successor in the same or different research area (according to the department's strategy) may be able to take office even before the retirement of his colleague. (ST Panel)

These points are well grounded but their implementation may be in conflict with present rules of the Swedish recruitment system, which implies that openings should be broadly defined, and departments should not be involved in the selection process. This circumstance is acknowledged by one of the panels in the following way:

The attitude to a strategy beyond this transitional period seems fairly laidback, perhaps due to a combination of structural peculiarities: One [...] being the *lack of control over important input factors* connected to funding and systematic recruitment from below. (HS Panel)

In the same spirit a number of panels have offered critical comments on the Swedish academic career system:

The career system should be developed. The double career tracks, especially the positions primarily for teaching should be reconsidered (HS Panel)

The introduction of promoted professors has generated a series of difficulties [...] that will gradually reduce the competitiveness of Swedish research. (ST Panel)

the doctoral students were worried about their long-term academic prospects after completing their doctoral studies. [...] The panel shares this concern (HS Panel)

A particular concern of the panellists is *the limited research time for faculty members*:

Few in permanent positions at the UU have research as part of their obligation (or right). Hence, research activity at UU of Uppsala [sic!] is vulnerable depending on few chair positions. (HS Panel)

To raise the level and the scope of research the teaching load (usually a high 80% among tenured personnel) should be lowered. (HS Panel)

Lectureships with very high teaching load are too common in the Swedish system. (ST Panel)

The panels also point out the negative effects of *the low mobility* in the Swedish academic system:

The lack of competition about the research positions, on the one hand, and the lack of mobility, on the other hand, inevitably result in a risk of moderate quality of research in the long run. This also impedes critical thinking and renewal. (HS Panel)

The panel was a little disturbed by what they perceived as a tendency towards internal appointments for chairs and emphasises that dynamic new blood is a key to making the most of the potential clearly available in Uppsala. (ST Panel)

All in all, panels are thus concerned about the possibilities for Uppsala University to manage its renewal. They stress that the University faces a drastic transition period with a large number of retirements. The University is recommended to consider this an opportunity for renewal by careful recruitment planning for the next decade. The implementation of this piece of advice may require creative thinking of the University leadership, but above all, changes in the whole system for recruitment and promotion in Swedish universities and university colleges. The critical remarks by panels regarding the existence of double career tracks, heavy teaching loads and inbreeding make such changes very urgent.

4.1.3 Funding

The comment by one of the panels cited above pointing to the negative effects of “*lack of control over important input factors*” applies to the funding of research as well. A major problem in this context, closely linked to the system of double career tracks, is the *separation of funding between teaching and research*. The panels are critical towards this arrangement and suggest a pooling of resources:

Budget rules allow, and according to our informants, makes necessary to separate teaching and research. For an active research-based university this is a serious obstacle and the university leadership should eliminate such separation wherever possible. To strengthen academic leadership and to create more dynamic autonomous units at the university, the different units should get a lump sum funding according to well defined criteria. The allocation of resources to different activities should be delegated to the basic units. (HS Panel)

The department should pool its faculty funding for education and research. This will make it easier to lighten the teaching load for the young faculty and to leave them more time for research. (ST Panel)

Presently, such an arrangement is not consistent with the rules. Information from the Government-appointed expert working on the future resource allocation system seems to indicate that these rules may be changed in the future. The university should therefore be prepared to handle such a significant change in the allocation of resources.

A related comment from one of the HS panels concerns *the instability of research funding*. In their view thus:

A sufficient part of the *funding should be basic, long-term and stable*, making a predictable recruitment policy possible. This goes for an extended number of doctoral students, particularly in those areas where this recruitment base is quite narrow, and also for an extended range of post-doctoral fellowships

for the most promising candidates. Such a policy requires a more long-term strategy for the future profile and development of the department. (HS Panel)

Likewise, a panel in the science and technology domain underlines the lack of internal resources for research:

Most division heads (chair professors) expressed concerns about insufficient funding through the faculty, thus confirming the impression of the panel. Increasing it is on one hand considered necessary to safeguard continuity and on the other to pursue projects in basic research. (ST Panel)

It is also pointed out by one of the HS panels that the present system with a significant role for external funding takes considerable time from research as well as pushes researchers into areas, which are fashionable, rather than stimulating them to pursue long-term research programs:

There is another danger combined in the preoccupation with renewal. It is a fact that large parts of the young scholars permanently have to apply for grants and subsidies – thereby losing much time for research. This can entail the consequence that some of the *alleged innovations follow short-living fashions which fit the desires of funding institutions more than the development [research]*. (HS Panel)

Another HS panel, however, is more positive towards the external grants and proposes the university to develop a system with matching funding:

UU should consider introducing an incentive structure recognizing and awarding attainment of external funding of research. A system of matching funding should also be considered (this is often a requirement by external funding agencies). (HS Panel)

In the same spirit two panels suggest that the University revise its system for charging *overhead costs* in order to avoid or reduce negative effects:

All the *departments suffer from great overhead-costs* for the funds they raise from outside. On the one hand there is a push for more applications for money, on the other hand the benefits of this time-consuming communicative work are endangered by too heavy “university taxations”. While it is obvious that the University charges an overhead for the external grants, the current system does not appear to treat departments quite fairly. It would be advisable for the University to develop a policy of charging overheads that would be fair and benefit both the University and its departments receiving external grants. (HS Panel)

Overhead money should have a more specific return route, which would make overheads less obtrusive, especially for groups that pay more overheads than they receive research funds from the faculty. This should be rewarded in some kind by the university, e.g. by more faculty funds for basic research. (ST Panel)

One panel even points out that the present system for resource allocation have led to sub-optimization:

The highly distributed funding model used at UU results in suboptimal performance. [...] the panel has observed that the completely decentralized funding system applied by Uppsala University has a large number of adverse effects. Perhaps the most visible of these is the obsessive preoccupation of most faculty members with the effect of any of their decisions on their budget and the sometimes perverse or conservative strategies that they develop to keep the budget they presently have. (ST Panel)

A panel in medicine went even further stating that the present system for resource allocation is unjust:

The panel discussed the Faculty's funding model that implies that groups are dependent, among others, on the impact of journals in which papers are published. This system is unjust and not motivating for certain areas and indeed under discussion. (MP Panel)

In conclusion, panels thus point out problems in the Swedish funding system and plead for more stable and long-term funding for research. They also comment on problems associated with external funding and the possibilities for the University to reflect over its resource allocation procedures. In that context, improper use of bibliometrics has been questioned by some panels.

4.1.4 Organizing

Like in many other evaluations, the panels of KoF07 have a number of comments on the organizing of research. A particularly common comment in the reports has been that *research units are too small* and that they lack critical mass. This is true for the panels for all three research areas of the University:

While the research is of high international quality and concentrates on central [...] issues, the groups are pretty small. (HS Panel)

important to maintain a critical mass of highly qualified research talent necessary to fulfil future research ambitions. (HS Panel)

We detected a number of “one-man shows”, i.e. scientific topics in highly competitive fields treated by a single researcher or a very small group, often not well integrated in the main activities of the division/department. (ST Panel)

All the units are small and none of them achieves a critical mass, which is particularly important for an inherently multidisciplinary field. (ST Panel)

As one participant put it, ‘this is a group of researchers rather than a research group’. One has difficulty finding the synergy within the department. (MP Panel)

In relation to this issue, several panels, more frequently in the field of science and technology, stress the need to *increase collaboration* with colleagues at other Swedish academic institutions:

Extended collaboration [...] with the other leading groups [...] would allow further improvement of the quality of the group. (ST Panel)

The Department should strengthen collaboration with other Swedish universities and research institutes. This is particularly important for those groups that lack critical mass and for sub-disciplines in which international-level expertise exists outside the Uppsala University. (ST Panel)

Traditionally, individual action has been much praised. Today, attention must also be praised to academic collaboration and research leadership, creating important informal structures within the departments. (HS panel)

The university must find mechanisms for transfaculty cooperation, facilitate and encourage departments to take advantage of teaching resources from other departments at other faculties. It should furthermore encourage and facilitate the creation and running of multi- and cross-disciplinary centers common to more than one faculty. (ST Panel)

In the same spirit *efforts for internationalisation* are suggested:

There is unrealised potential for bringing in overseas researchers with their own financial support. This may in the long term improve international networks and thus serve as a good basis for future international research projects. (ST Panel)

Finally, we would encourage the departments to engage internationally to an even further extent, including action at the European level (in particular the EU countries) [...]. EU funding is no doubt a raising factor. (HS panel)

International collaboration appears to be opportunistic rather than strategic. [...] The group could benefit from a strategic approach that includes visiting professors, and post doctoral studies in other countries. (MP Panel)

In order to achieve more focus and critical mass, some panels in medicine and pharmacy ask for *stronger academic leadership*:

Strong leadership is essential to ensure change. The panel felt strongly that the arrangements should be re-examined so that the Dean has funds and authority to implement change. (MP Panel)

there is a tendency to want to set up their own research group often based on reactive funding. Strategic leadership is therefore of great importance. (MP Panel)

Others point to the need to create a *consistency between informal and formal structures*:

[A structural peculiarity is] the *discrepancy between symbolic and formal leadership* (HS Panel)

It is important that one creates consistency between the informal and formal bodies within the Department. (ST Panel)

All in all, the comments boil down to a plead for *more strategic thinking*:

The strategy for future research orientation has to be developed including a prioritisation of topics and showing the possible synergies between the divisions. (ST Panel)

Our view was that the Faculty should engage in a strategic review, not only of research, but also of structure and funding mechanisms, so that means could be found across the faculty for significant investment in areas perhaps not connected to a single department. (MP Panel)

Some panels also explicitly point out the lack of such thinking presently:

The attitude to a strategy beyond this transitional period seems fairly laidback (HS Panel)

The panel is concerned about the lack of a long-term strategy and an action-plan regarding research areas to be covered in the future, research priorities, ways of responding to the European and international demands, etc. (HS Panel)

The groups' plans for the next 5-10 years often felt like 'more of the same elsewhere' rather than building an innovative research line based on past and present strengths. (MP Panel)

One of the HS panels, however, does not limit its comments to the governance of departments but has also two comments on the University as a whole:

The UU does not appear to have a culture of keeping track of its resources and their uses, nor of the outputs. This is an obstacle to effective planning and strategic change. (HS Panel)

The organising of the research in research groups promotes collaborative research efforts and interdisciplinary research. To avoid introducing a fourth administrative level at the university, UU should consider abolishing departments as an organising unit for research. Educational programmes could be organised at the faculty level. (HS Panel)

In terms of organizing the research, many panels thus point to the need to create larger units inside the University in order to achieve critical mass. They mention several examples of groups that are too small or individuals who are mainly working by themselves. It is therefore suggested that collaboration within departments is reinforced but also that the Uppsala scholars increase their joint work with colleagues in Sweden and throughout the world.

4.1.5 Conclusions on general observations

In reading the panel reports, a great deal of valuable information has been disseminated in the University. It is true for individual scholars, research group leaders, department heads, deans and the University leadership. Needless to say, a considerable part of this information concerns the lower levels of the University. However, as shown above, there are also a number of comments that has to be taken seriously also at higher levels, as a matter of fact even by policy makers. It is evident that the panellists have found peculiarities in the Swedish system both regarding recruiting and regarding funding. They therefore suggest changes to be made. Inside the University, they plead for a more

long-term perspective with a stronger focus on strategic choices regarding future research directions. Needless to say a change in that direction would be facilitated by changes in the systems for recruitment and funding.

4.2 Humanities and Social Sciences

The disciplinary area of Humanities and Social Sciences at Uppsala University consists of five faculties: Arts, Languages, Theology, Social Sciences and Law. In addition there is a separate faculty of Educational Sciences. The panels found that the research level and the level of productivity of the departments of these six faculties are generally quite impressive. Comments regarding research environment and infrastructure were often positive.

4.2.1 Arts

The Faculty of Arts basically consists of two parts: Aesthetic-Philosophical disciplines and Historical- Philosophical disciplines. It also hosts three interdisciplinary units: Centre for Gender Research, Centre for Multiethnic Research and the Programme for Holocaust and Genocide Studies. The first mentioned group of disciplines and the Centre for Gender Research was evaluated by panel 8, and the second group and the other two special units by panel 9 with the exception of the division of Egyptology that were evaluated by panel 7.

Aesthetic-Philosophical Disciplines

Department of Philosophy

The department consists of three divisions, Ethics and Social Philosophy, Logic and metaphysics and Aesthetics. The researchers of the department are divided into five research groups: 1) Philosophy of language, 2) History of philosophy, 3) Philosophy of science, 4) Practical philosophy and 5) Aesthetics. Panel 8 considered the general features of the research to be a concentration on central philosophical issues, ambitious international publishing policy, extensive international research networks, and interest in interdisciplinary research cooperation. The research was classified as being of high international quality, especially in groups 2 and 4. As renewal projects, the panel pointed to “Understanding Agency: Conceptions of Actions”, “Human Nature and Value in Western Tradition”, “Questions of Continuity in Wittgenstein’s Thought” and “Philosophical Aspects of String Theory”. It pointed to the possibility to essentially improve the research capacity through a new position in the philosophy of mind as well as new post doc research positions.

Department of Art History

Panel 8 considered the research in the department as active and diversified. It found medieval art studies especially strong and at an international level. Renewal is already taking place, i.a. through the projects “Art and society”, “Art and ideology” and “Art and identity”. In addition there are very promising cross-periodical studies. The international networking, however, according to the panel could be more consciously planned and elaborated. More academic capacity is needed, particularly junior faculty number and number of Ph.D. students.

Department of Literature

Panel 8 found the Department of Literature to be a rich intellectual environment. Its spread of research was considered impressive, as the volume of published output. The department does, however, seem slightly hesitant to define itself very actively along lines that would render its research profile more visible to the outside world. The panel recommends that the department moves more proactively, creating teams rather than projects on the individual level to get a synergy effect. Sociology of literature and rhetoric are two valuable additions to the department’s profile. The panel hopes that a chair of rhetoric will be created in order to stabilize this area as a research field in Uppsala.

Department of Musicology

The Department of Musicology, according to panel 8, puts special emphasis on historical awareness and reflexivity, while at the same time it upholds a dedication to researching music in a contemporary perspective, thus following leading international levels of theoretical and methodological concerns. The research is of high international standard, especially strong on 17th century music (the Düben collection) through the use of computer techniques. The panel finds that this activity could become a growing centre of a very fruitful cooperation between scholars. Concerning renewal, it is obvious to the panel that 20th century music should be given attention. The possibility for increasing the international impact of the department further is at hand due to shift in staff.

Historical-Philosophical Disciplines

Department of ALM

The department of ALM (Archive Science, Library and Information Science and Museum and Cultural Heritage Studies) is young and in a rapid phase of expansion, especially due to Library and Information Science. The research effort is, according to panel 9, still very small and the amount of available resources is below a critical size, but research activities are expanding. The quality is good. At present, the biggest need is research within digital media and bibliometrics. Due to the humanistic approach of the department, the

panel also finds it important that metatheoretical issues concerning the ALM disciplines be considered.

Department of Archaeology and Ancient History

The Department of Archaeology and Ancient History consists of four sub-disciplines with different research traditions and aims: Archaeology, Classical archaeology and ancient history, Egyptology and African and comparative archaeology. GIS and landscape perspectives, questions concerning mentality and religion are common interests, and panel 9 therefore recommends more collaboration between the sub-disciplines. It also points out that the recruitment of younger scholars is necessary, since most of the staff is close to sixty. Both African archaeology and Egyptology are considered to need one more academic teacher.

Archaeology (North-European): Panel 9 points out that Nordic Archaeology has been traditionally very strong in Uppsala, in particular in Late Iron Age-Viking Age, but also other periods. The sub-field has been strong in formulating interesting research perspectives with historical implications and is also one of the archaeology departments in Scandinavia that has made the most use of textual material. An MA program in laboratory archaeology and GIS and landscape perspectives is being run in collaboration with Stockholm University. The panel found the research to be of internationally recognized standard to internationally high standard.

Classical Archaeology and Ancient History: The panel has noted that many different individual research projects ranging from Bronze Age to Late Antiquity are being carried out. Ancient history is in part heavily integrated in Classical archaeology. The research is considered to be of internationally recognized standard to internationally high standard.

African and Comparative Archaeology: This subfield of archaeology, panel 9 points out, has been supported by substantial external funding over many years. As a result, it has been possible to start a completely new direction which has wide-reaching contacts and important ramifications both within Uppsala and abroad. The significant GIS profile of the department stems from this branch of archaeology. The Ph.D. students, both Africans, Swedes and others, have had considerable success. According to the panel, the research is of top-quality, world-leading.

Egyptology: Panel 7 observes that the output in publications consists of numerous articles and book reviews and a remarkably high number of doctoral dissertations. The publications are generally of internationally recognized standard, if not high standard. Some should be considered top-quality. Some members of the unit would prefer to be located among the philologists. There is a certain lack of focus as to research areas, which may be due to the fact that the personnel are too limited in number.

Department of History

Panel 9 states that history has a long and glorious tradition at Uppsala University, which is a source of pride for the department. But it is also a history of continuous change. Today the department represents a generalist ideal in contrast to the former heavy specializations. The panel finds the so-called base groups joining researchers of all levels with common interest commendable. The research is of internationally recognized to high standard. The intention to increase post-doc positions when the number of Ph.D. students decreases is likely to lead to a reorientation of ongoing research, but no policy for renewal has been documented.

Department of History of Science and Ideas

History of Science and Ideas, panel 9 points out, is a young discipline, which has become one of the most attractive ones in the humanities. There are groups of scholars discussing history of science, history of medicine, history of philosophy, history of political ideas but also media research and studies in technology and science. Since the time of Sten Lindroth, scholars from this department have become prominent in Swedish culture. The research activities are generally of an internationally recognized standard, some of it comes close to the highest level. The new Chair professor of History of Science is trained as a physicist as well as a historian; he will be able to considerably renew the science history parts of the research program. The department should be supported with one or two more positions as assistant professors.

Department of Cultural Anthropology and Ethnology

The Department of Cultural Anthropology and Ethnology consists of two divisions, former independent departments. According to panel 9, there is a common interest in questions about changing identities and multiculturalism. In the studies undertaken, there is a repeated return to conflict, exclusion and vulnerability. The ambition is an applied anthropology/ethnology with an impact on social practice at the local level. The panel found the quality of research to be of an internationally recognized standard, some of it of high international standard.

In the division of Cultural anthropology research has been undertaken in Africa, Asia South and North America and the Saami area. All in all the Uppsala anthropologists have, in the view of the panel, produced noteworthy and innovative scholarship. Research into Saami reindeer pastoralism has developed into research in political ecology.

In the division of Ethnology, the research in particular concerns new modes of urbanism and multiculturalism with transnational connections as well as research on children, youth and women conducted in collaboration with local authorities. The panel found a strong and innovative theoretical foundation, especially in gender studies and studies of late modern urban societies.

Interdisciplinary Units

Centre for Gender Research

The Centre for Gender Research, in its current form established in 2003, is by panel 8 characterized as a dynamic, supportive and very good work and research environment. It is interdisciplinary and should include social as well as biological perspectives on gender. The research is of international standard in the eyes of the panel. The research topics are of international interest and of high relevance scientifically as well as from a societal perspective. Currently too much is published only in Swedish, but the role as an interdisciplinary meeting point will lead to internationalizing the publishing profile. The opportunities for renewal appear excellent. The new excellence funding enables targeted hiring of Ph.D.-students and post-doctoral researchers. The centre could, according to the panel, get a more active role by collecting and making available a continuously updated database of on-going gender research and gender expertise at Uppsala University.

Centre for Multiethnic Research & the Programme for Holocaust and Genocide Studies

The additional two separate units are research units, but they also contribute to the teaching in several departments. Panel 9 stated that the quality of the research activity certainly meets internationally recognized standard. Much of the research on the Balkans seems very innovative. The research on multiculturalism in Sweden has also been highly regarded and much needed from a national perspective. The individual scholars are active in international and national networks and are often requested by the media to comment on important ethnic and political matters.

4.2.2 Languages

After mergers between departments, the Faculty of Languages presently consists of four departments: English, Linguistics and Philology, Modern Languages, and Scandinavian Languages. They were evaluated by panels 6 and 7. On the whole the panels found university infrastructure to be adequate, even good to excellent.

Department of English

The Department of English contains divisions of English Literature, American Studies, English Linguistics and of Celtic Studies. The first three were evaluated by panel 6 and the last one by panel 7. They found as a general problem that important posts are vacant or are in the process of being filled.

English Literature

Panel 6 found that the strengths of the unit for English Literature are to be found in two areas: the Renaissance and Early Modern period and the early

20th century. Much of the work is of internationally recognized standard. Concerning renewal, much will depend on the new Chair professor, probably there will be an increased use of computer analysis and a possible turn toward eco-criticism.

American Studies

According to panel 6, the unit for American Studies is a unit with a distinctive identity and pioneering new methodologies. It comprises two sub-units, American Literature and SINAS, the study of American history and society. Much of the work is of an internationally recognized standard, some of it coming up to high international standard. The panel emphasises that Uppsala has the only Chair of American Literature in Sweden. The dual emphasis on literature/culture and recent history has led to collaborative research and publications. Computer based research of questions of authorship as related to developments in society and promising research into verbal-visual phenomena are pointed out as lines of renewal.

English Linguistics

The work in the unit of English Linguistics is by panel 6 generally considered to be of internationally recognized standard. According to the panel, the work in English historical linguistics at Uppsala University is even outstanding and well-known internationally. Researchers from this sub-unit are involved in a number of forthcoming innovative projects.

Celtic Studies

Given the resources available, panel 7 considers the research of the unit of Celtic Studies impressive, of internationally high standard. Good use has been made of the Erasmus and Socrates networks: Swedish students have studied in the Celtic countries and Irish students have come to Uppsala. Renewal is possible only if the staffing situation changes for the better.

Department of Linguistics and Philology

The Department of Linguistics and Philology includes divisions of Turkic and Iranian Languages, General Linguistics and Computational Linguistics, Latin, Greek and Byzantine Studies, Indology and Comparative Indo-European Studies, Assyriology, Semitic Languages. The Department was evaluated by panels 6 and 7.

Turkic and Iranian Languages

In the view of panel 6, it is a fortunate position that both Iranian and Turkic languages are included in the division, with the result of a fruitful cooperation. The research on Balochi, Karaim and typology of the Turkic languages is specially emphasized by the panel. It is considered of internationally high standard, which is also said about the studies on Nogay. Language documen-

tation, especially when it comes to endangered languages, is seen as an important part of an activity that seems very promising. The diversified high-quality research activities within Turkology give this division the potential of becoming one of Europe's leading centres of Turkic studies. However, in order to attain this goal, the panel points out, the cultural aspects of Turkic studies should be strengthened by research in Turkish or Turkic literature.

General Linguistics

The division of General Linguistics is by the panel 6 characterized by the combination of typological studies and studies of language acquisition with reference to corpora. Much of the research is of an internationally recognized standard, some of it, especially in lexicology and typology, reaches a high international standard. A mix of older and younger researchers provides a good research environment. The planned research on Specific Language Impairment in collaboration with the Department of Speech and Language Pathology at the Faculty of Medicine is considered a promising area of new research. A new psycholinguistics laboratory is found to be needed for this research.

Computational Linguistics

The division of Computational Linguistics, panel 6 states, builds on the long-term experience of research in computational linguistics and natural language processing at Uppsala University but enriches it with up-to-date methodology and trends. The work of senior scholars is well complemented by the work of young devoted researchers. The research is graded as top quality, world leading. The strongest points are automatic syntactic analysis, advanced methodology in machine-translation research and corpus-based research for applied purposes like machine translation, e-learning and automatic language understanding. There is a high potential for future development and activities. The division has an extensive international network of collaboration. The most promising new research direction is connected with the plans for a Linnaeus Grant project, which aims at establishing a strong research environment where computational linguistics, general linguistics and individual languages will cooperate interdisciplinary for the whole faculty. This project is highly recommended by the panel.

Latin

Panel 7 found that the research in the Latin unit has a strong diachronic profile with an emphasis on Neo-Latin studies. The editing, translating and commenting of texts has a long tradition and is very valuable. The work is deemed to be of internationally high standard with world-leading research within the field of scientific Neo-Latin. A joint project, the Ancient Tradition, is an extremely successful constellation of Greek and Latin. The new department of Linguistics and Philology is described as a success. The panel encourages the unit to

maintain its successful interdisciplinary collaboration locally as well as internationally.

Greek and Byzantine Studies

Panel 7 regrets the situation that the Chair of Ancient Greek is vacant. As a result, the Chair of Byzantine has to carry out the duties of both chairs. Uppsala University is well known internationally for its pioneering work on Byzantine hagiography, now supplemented by work on secular Byzantine literature. The quality of research is graded as high, within the Byzantine field of top-quality, world-leading. Greek could also be impressive, but only if the Chair of Greek is filled.

Indology and Comparative Indo-European Studies Linguistics

The Chair professor, panel 7 points out, is a leading authority internationally in the study of medieval epic and narrative literature in the languages of eastern India. The work of the unit is of very high international standard. A South Asia Seminar is a first step towards a closer collaboration with several other departments within the university. India is emerging fast as one of the leading countries of the world, both economically and politically. There is a need for Sweden to train specialists of India in various fields of life. According to the panel, the Oriental Programme (*Orientalistikprogrammet*) should be widened and supported. Sanskrit and classical Indian culture are indispensable for understanding Hindi and modern India and Asia at large. It is vital that teaching and research in classical Indology does not suffer from the expansion of the unit's activities towards modern studies.

Assyriology

Panel 7 notes that the discipline is recognized as a national responsibility to be fulfilled by Uppsala University. The academic staff consists of one promoted professor, and the panel wants to see one more staff position. There is long-term collaboration with the important collection of cuneiform inscriptions of the Vorderasiatisches Museum in Berlin. The research is considered to be of internationally high standard. The unit has a strong international network and is now involving itself in the highly innovative initiative Urban Mind. This is a framework for scholars who work with the ancient and modern Near East and surrounding areas, involving research groups with different but related themes.

Semitic Languages

The unit of Semitic Languages is by panel 7 found impressive, in terms of both scholarly breadth and depth. The current research projects cover a vast area of topics from grammatical issues such as circumstantial qualifiers in Semitic to modern literature in the Gulf States, discourse analysis of Arabic TV programs and religious imagery and tradition in modern Palestinian and Israeli Hebrew

literature. The quality of research is of internationally high standard, some publications are truly excellent. The research activities are highly impressive and deserve all the support they can get.

Department of Modern Languages

The department is composed of four units: Slavic Studies, Finno-Ugric Languages and Literature, German, and Romance Languages. They were all evaluated by panel 6, which gave the general recommendation that the units (former independent departments) should have a more active collaboration.

Slavic Studies

Panel 6 points out that the focus of the division of Slavic Studies on diachronic linguistics and philology is unique in Sweden. There is collaboration with outstanding scholars from all over the world. The productivity is high or even very high. Much of the research is of an internationally recognized standard. Research on Church Slavonic translations, the translations of newspapers into Middle Russian and Russian-Swedish lexicography reaches a high international standard. Research on Polish literature shows the potential of reaching a high international standard.

Finno-Ugric Languages and Literature

The main emphasis of research in the unit of Finno-Ugric Languages and Literature, panel 6 writes, is on the four Finno-Ugric languages spoken in Sweden, Saami, Finnish, Hungarian and Estonian. According to the panel, most of the research is produced by individual researchers who do not seem to have much collaboration. The unit has a long and internationally reputed tradition in Saami studies. Much of the research is of an internationally recognized standard. Research on Saami and Estonian and also the minor Finno-Ugric languages and cultures reach a high international standard. The study of old Saami texts held at Uppsala University is unique and should be strengthened.

German

The unit of German has, according to panel 6, a strong tradition in language history, which has been developing in new directions incorporating theoretical and methodological perspectives from modern linguistics. The research is of an internationally recognized standard. The strong diversification is a strength according to the unit itself but a possible problem in the view of the panel. A good point is the interdisciplinarity between linguistic and literary research. A new project “Language and society in the 17th century” opens up new possibilities. The unit could try a bit harder to create international networks.

Romance Languages

Panel 6 found that the dominant research focus in the unit of Romance Languages is on modern French linguistics. The work is of an internationally

recognized standard, some research areas (referentiality, proper names and modality) are of an internationally high standard. The situation and projects within French linguistics offer a unique possibility for renewal. There are clear synergy possibilities between the two areas; epistemic expressions and electronic discourse. Cooperation with the Department of Linguistics and Philology might be particularly fruitful.

Department of Scandinavian Languages

Scandinavian Languages

The department, panel 6 states, builds on long and proud scholarly traditions, particularly in language history and comparative linguistics, strengthened in the 1970s with sociolinguistics and text analysis. Much of the work is of an internationally recognized standard. Some of the research in socio-linguistics and discourse analysis is of high international standard. The synergies between the different parts of the department might be strengthened. The plans for taking part in the Linnaeus Grant project are highly recommended. Concerning renewal, there is a pronounced interest in studies of the new multicultural and multilingual societal situation in Sweden.

Runology, Early Scandinavian Languages and Onomastics

In the area of Runology, Early Scandinavian Languages and Onomastics, panel 7 found a smooth cooperation among staff members in various constellations and in a number of subjects. The panel even had difficulties to point to any apparent weaknesses in the onomastic and historical team of the department. The staff publishes very broadly and edits an impressive number of periodicals, several of them leading publication channels in their fields. The research seems to be well balanced and diverse in its approach; it should be classified as top-quality.

4.2.3 Theology

The Faculty of Theology, consisting of 5 divisions and one centre, was evaluated by panel 11. The panel's overall impression was positive. It found a good spirit of willingness to find new ways and to study new subjects with a marked contemporary interest of the academic society and the society at large. Nevertheless, the panel recommended that the great variety of research going on in most disciplines should be focused in fewer research areas in order to create synergy. A request of publications by *all* scholars was put forward, and it was stated that publications are needed in Swedish as well as foreign languages. Publication in highly esteemed refereed journals should increase.

Panel 11 also pointed to the need to consider the number of disciplines. The faculty should think thoroughly about the organisation into disciplines and work for a strong and committed interdisciplinary cooperation, inside and also outside the department. The panel's recommendations are to establish research

groups and to a lesser degree depend on individual research. In addition, the panel also had many suggestions to develop the Ph.D. education: start closer collaboration with other theological faculties abroad (supervision, etc.) and explore the possibilities to recruit a larger number of post-doctoral scholars. Furthermore, the international cooperation in some of the sections could be strengthened.

In terms of the quality of research, panel 11 grades it from acceptable standard to internationally high standard. Specific comments on the divisions and centres are:

- *Biblical Studies*: No general remark on research, due among others to the weak self-assessment, something which calls for improvement.
- *History of Religions*: Needs for further international networks and collaboration.
- *Church History*: Has a too narrow scope.
- *Mission Studies*: Describes plans that look promising.
- *Sociology and Psychology of Religion*: Fruitful in the past, promising ideas for the future.
- *Centre for Religion and Society*: Strong and result-oriented research group.

The three most promising future research directions are considered to be “Contemporary Biology, Media and Worldview Formation”, “The Impact of Religion: Challenge for Society, Law and Democracy” and “Religion, Peace and Conflict Research”. The panel also finds the possible research on “Didactics, Pentecostal Studies” of interest, but adds that the plans so far are not very distinct.

The role of the Karin Boye Library in relation to the Carolina Rediviva Library needs to be clarified. The faculty should support a highly profiled research library.

4.2.4 Social Sciences

The Faculty of Social Sciences basically contains three groups of departments: Behavioral Sciences, Economic Sciences, and Political Sciences. The departments of the two latter groups are jointly located in *Ekonomikum* and *the Old Square*, respectively, while those in the first group will be moved together in a not too distant future. In addition, the Faculty of Social Sciences has an interdisciplinary Institute for Housing and Urban Research located in Gävle. In summarizing the panel reports, we will use the mentioned three-part division.

The research of this faculty was reviewed by panels 1-5 as follows: 1. Economics and Statistics; 2. Business Studies, Social and Economic Geography, Institute for Housing and Urban Research; 3. Education, Curriculum Studies, Pedagogy, Sociology, Media and Communication, and Domestic Sciences; 4. Government, Peace and Conflict Research and Eurasian Studies; 5. Psychology. Economic History, which is also a department of the faculty of Social

Sciences, was evaluated in panel 9 together with several departments belonging to the faculty of Arts.

Behavioural Sciences

The Behavioural Sciences at Uppsala University comprise three departments, i.e. the departments of a. Education, b. Sociology, and c. Psychology. In addition, the Division Food & Nutrition in the Department of Domestic Studies has a link to this group of disciplines. This also applies to the Faculty of Educational Sciences (see below).

Department of Education

For the Department of Education, panel 3 notes that the research profile is diverse. However, the research is found to be well organized in four research groups dealing with educational policy and educational philosophy, interaction and experiences in educational settings, higher education, and social practices, respectively. Of these, the two first mentioned are identified as golden nuggets by the panel. For the future, the panel recommends further creation of research groups, increased collaboration and theoretical and methodological development. The overall impression of the panel is that the research in this department holds internationally high standard.

Department of Sociology

For this department, panel 3 recognizes that research in gerontology has an international reputation and points out research about childhood, youth and disability as golden nuggets. However, it also points out that further advances require strategic decisions. More specifically, the report stresses the risks of the bias towards policy relevance in the research and advocates a stronger emphasis of social theory, history of social thought and research methods. The panel also identifies that research teams are mostly working on their own and therefore advises them to collaborate to a higher extent. In order to handle panel advices, it is suggested that the leadership be strengthened and that the department obtain better support.

Department of Psychology

Panel 5 reports a very positive picture of the department and states that it “as a whole is an outstanding department with several research constellations with highest international competitiveness”. It also states that it “is one of the very strongest in the Nordic countries with several top-quality research areas”. Among areas of research, the panel particularly mentioned: 1. infant perceptual-motor behavior, 2. human judgment, decision making and higher-level cognition, 3. affective neuroscience research, and 4. longitudinal studies on socio-emotional development. In addition, there are “a number of individual researchers who conduct science at an internationally high standard and contribute significantly to the scientific output of the department”. The lat-

ter research is directed towards chemoreception based perception and cognition, socio-emotional development, cognitive behavioral treatment of chronic illnesses, music and emotion, and personality and prejudice. Overall the research has to a large extent been financed through external grants, a circumstance which the panel considers a sign of quality recognition. At the same time, the panel is critical towards the standard of the infrastructure of the department and points to a need for improvements in that respect. For the future it points out the need for strategic thinking as significant department members are retiring. In that context, they see particular potential in the areas of infant cognition, emotional processing related to music perception, cognition, human development, and psychopathology. The panel even raises the question about a restructuring of the Department into larger focused research units. It also recommends collaboration with psychometric and statistical expertise as well as the co-organizing of courses with sister departments in Stockholm.

Department of Domestic Studies

For the *Division Food & Nutrition in the Department of Domestic Studies*, panel 3 declares that it had difficulties in making a well-founded judgment of the research. Nevertheless, it saw potential for development and considered the unit “a golden nugget in itself”. However, it also pointed out that the unit is very small and it is therefore recommended that the university take steps to make it more robust. The *Division Textile Studies*, evaluated by panel 8, will in the near future be moved to the Faculty of Arts, department of Arts. The assessment of the division is a bit problematic, as the research is assessed to be of international standard, but “deserves to be highlighted as a ‘golden nugget’ of the faculty”. The researchers have developed a highly qualified interdisciplinary approach. The empirical material present in Uppsala is unique and world famous. The division needs more academic staff in the nearest future.

Economic Sciences

The Economic Sciences include the Departments of Business Studies, Economics, Economic History, Social and Economic Geography and Information Sciences.

Department of Business Studies

Panel 2 pointed out that although the Department of Business Studies contains a number of research groups “it strongly functions as an integrated department”. Within this overall framework, there are five research groups: 1. International business, 2. Marketing, 3. Management and Organization, 4. Accounting and Finance, and 5. Entrepreneurship. Of these the first three have, as pointed out by the panel, long traditions, while the last two are later additions. The latter is particularly true for the entrepreneurship research, which was initiated in 2005 through an endowed chair. In evaluating the quality of the research the panel found that the first three groups (international business,

marketing, and organization and management) hold an internationally high standard. For accounting and finance it was concluded that the group “is in an early stage of development that has potential to grow into a credible research group”. For the time being the group was assessed to have an acceptable standard. Finally, the Entrepreneurship group was considered to be too recent to rate, although the prospects seemed promising. In terms of the future development, the panel recommended further efforts to develop the research profile, particularly through increased internationalization. It also expressed a certain concern regarding possible difficulties to recruit competent persons in order to maintain and develop the research.

Department of Economics

Panel 1 reports that the research in the Department of *Economics* is focusing on three areas: labor market economics, public economics and macroeconomics. This research is found to be “somewhere in between world leading and internationally high standard research”. In addition, there is research in micro-econometrics and environmental economics, which is also “of high quality”. Furthermore, the panel is very positive towards the overall organization of the department and particularly its Ph.D. program, which is considered to be among the top ones in Scandinavia. It also points out that faculty members have a high output with publications in excellent journals. For the future, the panel advises the department to increase its internationalization by attracting international long-term senior visitors and increasing the visits abroad by faculty members. It is also pointed out that for the future crucial recruitment processes, the present Swedish system is far from optimal, as it takes too long time and does not permit strategic thinking. The panel is particularly worried about the insecurity of young scholars, especially of women of a child-bearing age.

Department of Economic History

In their general assessment, panel 9 labeled the Department of Economic History “as one of the central institutions of economic history in Northern Europe”. It grouped the research in the Department into three groups: 1. general social and economic history, 2. labor market and welfare policies, and 3. financial and business history. The panel considered most of the research to be of a high international standard. The latter is according to the evaluators particularly true for the research on labor markets, financial and business history. It therefore endorses the planned development of a Centre for Financial and Business History, which would act in a field presently characterized by a very dynamic development. This would also stimulate further cooperation within and outside Uppsala University. For the future, the panel expresses some concern about the possibilities to recruit competent people.

Department of Social and Economic Geography

Panel 2 ascertains that the two main research fields of the Department of Social and Economic Geography are: 1. Economic geography and 2. Population and Social Geography. Both these groups have an internationally high standard according to the panel. The first field implies a focus on innovation, clusters and industrial dynamics. In Uppsala, it has been institutionalized within the Centre for Research on Innovation and Industrial Dynamics (CIND), which in the words of the panel “has gained an excellent international reputation, being a vigorous and dynamic research group within its specialization”. Population and social geography, on the other hand, covers topics such as urbanization/counter-urbanization, rural and urban planning, residential segregation and settlement policies, on which the group has been quite successful in publishing internationally. In addition to the two mentioned major research fields, there is also, what the panel labels as “one more loosely connected group, consisting of three subunits”, i.e. a. Transformation socio-spatial process in the East and Central European landscape, b. Development studies, and c. Applied environmental impact assessment. The panel considers research in this group to be of acceptable standard. For the future the panel expresses some concern regarding the succession process. A recommendation is therefore that “mentoring and developing successors and an active succession planning in general should be given high priority”.

Department of Information Sciences

After a merger in 2000, the Department of Information Sciences has three divisions: statistics, media and communication, and informatics. These three units have been evaluated by three different panels (1, 3 and 18). Nevertheless, they seem to share the opinion that the present organizational solution is not optimal and that none of the three divisions has a critical mass. Restructuring is therefore recommended.

As far as the *Division of Statistics* is concerned, panel 1 identified ongoing research in the areas of econometric/time series analysis, biostatistics, structural equation modeling and geophysics. However, the panel also points out that the three last mentioned areas have declined in importance as a result of retirements of faculty members. Most striking to the panel is the fact that the research in the area of structural equation modeling, a flagship during the time of K. G. Jöreskog and still widely used world-wide, has not been kept at previous levels. The panel members also point out that biostatistics has long traditions at Uppsala and constitutes an important field for collaboration with the medical faculty. Presently, it is considered to hold an acceptable to an internationally recognized standard. For the future, the panel recommends the recruitment of a professor of biostatistics to be located in the Department of Mathematics or close to epidemiology research. Best appreciated by the panel is the research into econometric/time series analysis, which is considered to hold an internationally high standard. The panel recommends the merger of

this group into the economics department. Finally, the standard of geophysics is not discussed, since it is likely to disappear with the retirement of its single active member.

In terms of the *Division Media and Communication*, panel 3 indicated problems to provide a well-founded judgment of research quality due to its composition. Nevertheless, it was anyway clear to the panel that the research of the division is quite disparate. The panel also concluded that “the division under its present conditions is not able to reach an internationally recognized standard”. It is therefore of the opinion that the division would need better support from the university and another organizational solution.

Finally, panel 18 considers the *Division of Information Science* a too weak research environment. The panel therefore recommends restructuring. It suggests that the unit of Human-Computer Interaction be moved to the Information Technology Department within the Faculty of Science and Technology. In addition, it suggests “discontinuation or profound reorientation of the activity in the group called ‘Computer Science’”.

Political Sciences

Political Sciences are located around and in the neighborhood of the old square in Uppsala. In all there are three departments: Department of Government, Peace and Conflict Research, and Eurasian Studies.

Department of Government

Panel 4 divided the research in this department into five main areas: 1. democracy and democratization, 2. political economy and the welfare state, 3. political sociology, with political participation and citizenship, 4. developmental issues and 5. international relations. It points out that this broad research profile is a result of obligations for one of the few major political science departments in Sweden as well as a tradition of great autonomy of individual scholars. In terms of publications, the panel found a certain change from the heavy monographs towards the publication in high ranked international journals. All in all, the panel characterized the Department as “a vital research environment with extensive output on a high level” with openness to internal as well as external cooperation. However, it also pointed to a need for “a clearer and more integrated leadership structure” particularly in relation to the upcoming retirement of significant players in the Department.

Department of Peace and Conflict Research

This department is relatively young in terms of research with two chairs, one established in 1985 and the other one in 2003. Panel 4 has noted that its research agenda has particular focus on “the causes, processes, and consequences of the organized violence” and that the research is highly dependent on external funding. It also points out that the Department has a strong international orientation in terms of exchange as well as publications. Interna-

tionally, the Department is particularly known through the Uppsala Conflict Data Program (UCDP), which is a highly cited database of wars. The panel encourages the Department to continue the work with UCDP and states that it has the potential to become a flagship for the University. However, at the same time the panel stresses the need to invest in “the development of a coherent and intellectually challenging research agenda”.

Department of Eurasian Studies

The department in itself is an example of renewal since it was transformed as late as in January 2006 from an orientation towards East European Studies. Panel 4 characterizes the Department as “an area-focused interdisciplinary research centre” with a basic research orientation towards systemic change and comparative institutional developments and pathological developments in the former Soviet space (“The Silk Road Program”). In addition, through Ph.D. students from different departments, there is ongoing research on political development, nationalism, regional cooperation, mass media, crisis management, security and foreign policy, as well as the emergence of the rule of law. In terms of publications, it observes a mix of international peer reviewed publications and policy-oriented documents. For the future, the panel points to the opportunities to exploit the expertise in Russian studies as well as on the Caucasus and Central Asia. It envisages a strong potential in the combination of basic research and policy oriented research.

Institute for Housing and Urban Research

The Institute for Housing and Urban Research, established in 1994, is a multidisciplinary institute in Gävle with researchers from a number of disciplines within the social sciences. Human geography, political science, sociology and economics are those best represented in the institute. In addition, there are also researchers from psychology, anthropology, ecology and economic history. The research is primarily directed towards housing economics and policies, urban life and city planning, ethnic and gender relations and sustainability. The results are to a considerable extent published in international journals. It is also noted by the panel that staff members, particularly the geographers and the sociologists, contribute to their department in Uppsala through joint appointments. It is also pointed out that the multidisciplinary environment is helping “researchers to broaden their approach, gain a deeper understanding of the topic and test concepts used in their discipline”. For the future, the panel endorses the plans for an Uppsala Centre for research on social integration and segregation. Finally, the panel points out that the cross-disciplinarity makes it difficult to assess the different research groups. They therefore conclude that “the institute as a whole is regarded by the panel as having an internationally high standard”.

4.2.5 Law

Panel 10 was generally “quite impressed by the overall quality and quantity” of the research in the *Department of Law (Faculty of Law)*. However, they also expressed concern about the limited size of research groups, the research time of faculty and the lack of long-term strategy. As for the latter, the panel recommended a future focus on four areas, all with an international orientation: 1. Combination of international private law and family law, especially with its multicultural aspects, 2. Combination of international human rights law, European law and constitutional law, 3. Comparative and interdisciplinary approaches to legal history, and 4. Combination of criminal law, European law and international law. The international orientation is also emphasised in their recommendation to the Faculty to invite foreign scholars for longer periods and to increase the visits abroad by faculty members. Even if the panel finds that the Faculty is linked to national and international networks, it suggests an increasing cooperation in joint research projects. In addition, the panel recommends an increase in the recruitment of doctoral students.

4.2.6 Educational Sciences

The Faculty of Educational Sciences contains seven units involved in education and training for teaching. The faculty collaborates with more than thirty departments from six faculties within the university. There are two departments, which were subject to the KoF07 evaluation: the Department of Curriculum Studies and the Department of Studies in Education, Culture and Media.

Department of Curriculum Studies

In reviewing the Department of Curriculum Studies, panel 3 was struck by the fact that the Faculty of Educational Sciences is not recognized as a scientific field in the university. This observation led it even to state that “[t]his can not be considered fair or serious, that the university treat one of their faculties as an exception, and still expect research”. The panel found two research groups: “Studies of Language Practice” and “Studies of Meaning Making in Educational Discourses”. None of them has substantial internal research resources, and therefore the panel was impressed with the research performance under these circumstances. This has been accomplished through external grants and collaboration in networks.

Department of Studies in Education, Culture and Media

Panel 3 identifies the Department of Studies in Education, Culture and Media as a scientific laboratory highly inspired by the work of Pierre Bourdieu with research oriented towards the sociology of culture and the sociology of education. In terms of quality, the panel considered the department a “golden nugget” and therefore endorsed its Linnaeus application. It is noticed that the

unit has a large network which differs from others by not being primarily oriented to the Anglo-Saxon research community. In addition, the panel welcomes the initiative of the department to collaborate with other units in the University at the same time as it also points to the risks associated with the retirement of the present leading figure.

4.3 Science and Technology

The research of the Faculty of Science and Technology was reviewed in seven different panels: 12. Mathematics, 13. Physics, 14. Chemistry, 15. Biology, 16. Earth Sciences, 17. Engineering Sciences, and 18. Information Technology. There were cases of cross faculty review events, such that e.g. the computer science activity belonging to the Faculty of Social Science was evaluated by panel 18.

The general assessments of the panel reports usually give a brief description of the departments in terms of research directions, size and organization etc., although, in some cases they also express assessments in more general terms regarding specific achievements, synergies, collaborations, etc. Appreciative mentioning of successful management of research organization and implemented research strategies is occasionally made.

Generally, research activities were graded according to the recommended quality rating, with the lowest grade usually at the level of acceptable international standard (the main task was to identify strong points, and it was not mandatory to grade all research). The panels identified a number of research groups that they consider to be pursuing research of internationally very high quality, usually referred to as world leading or top quality. Ratings that fall short of what was considered potentially high quality were often specifically commented on in terms of suggestions for improvement.

Comments regarding research environment and infrastructure were often quite positive, although one finds examples of potential for improvements. These concern, for instance, better exploitation of synergies offered by increased contact and collaborations between groups; lack of incentives to develop suitable graduate courses; the composition of the work force in terms of senior researchers, junior researchers, postdocs and research students. The present infrastructure available to researchers of this faculty is generally commended although questions on future upgrade and renewal are raised in a few cases.

4.3.1 Mathematics and Information Technology

Department of Mathematics

Panel 12 found that the Department of Mathematics is presently in a difficult situation as its activity is seriously obstructed by personal conflicts. How-

ever, the panel expresses a positive view and points to the fact that younger researchers seem to be little affected by the situation and are in fact doing outstanding research.

The quality of research is internationally respected according to the panel, and one identifies a few activities of top quality. In particular the research by S. Janson is mentioned to be of top quality, as well as research in the fields of analytical number theory and topology. The research infrastructure needs consideration regarding age profile and staff composition. A careful plan for replacement of senior scientists is needed, and one needs to strengthen the staff with respect to junior faculty and postdocs. The group structure is fragmented which does not promote either cross-fertilization or attracting major grants, and one recommends creating larger groups. Networking is very good and joint research is fruitful, but the panel notices that EU involvement is lower than it should be.

The panel finds it necessary to strengthen a number of activities in important fields. Two of the fields mentioned to be underrepresented are statistics and nonlinear partial differential equations. As to actions for successful development, the panel urges the University to consider the organizational model for the department and implement a clearer structure. Among other issues, the panel addresses the proposal of a Centre for Applied Mathematics. It endorses the idea and discusses important elements of such structure, such as links to Scientific Computing and other activities at the University.

Centre for Image Analysis

The Mathematics panel concludes that the interdisciplinary research at the centre maintains high international standard and appreciates that results are published at a steady rate in high quality international journals and good conference proceedings. The panel notes a good gender balance at the centre, but also that the number of permanent staff is small in comparison with temporary staff.

The infrastructure and research environment of the centre is considered to be excellent. Networking and collaboration is noted to be in place with important research partners both nationally and internationally. The panel considers the regrouping of remote sensing and GIS activities to the centre to be an important opportunity for renewal, and it points at interesting possibilities in life sciences and in a future Centre for Applied Mathematics. The panel recommends intensifying cooperation with groups in discrete mathematics and scientific computing.

Department of Information Technology

The Department of Information Technology was found by panel 18 to host research activities of at least international recognized standard, with several groups in par with the international top level or even of world leading standard. Mentioned in the top level category are research efforts in Verification,

Computer Architecture, Systems Identification and Signal Processing and in Memory Management Techniques. The department shows good acceptance rate for its proposals to national funding sources, whereas EU-funded research is fairly small.

The panel emphasizes that evaluation of research in computer science and technology based only on journal publication may offer a deceptive view as impact is more often expressed in other ways in these fields, such as conference proceedings, awards and books. It raises concern that too much weight on journal publication may prompt faculty to work along lines that may be less productive than necessary.

The panel makes a number of observations that are considered important for the operation of the department. Effects of the distributed funding model used, the way the research groups are organized, the distribution of teaching duties, and lack of collective strategies are addressed. Issues concerning the appearance of similar research activities in another department, as well as in a different faculty were also specifically discussed.

Recommendations given include the development of a medium-term research strategy; parallel recruitments to fill upcoming senior faculty vacancies in accordance with the strategy; adding competences in a few defined areas of research. The panel offers advice regarding a few interdisciplinary centers, and in particular, it expresses its view on measures needed to further develop the Bioinformatics centre, which it considers to be an activity of central strategic importance.

Division of Scientific Computing

Panel 12 found the Division of Scientific Computing to be a well-organized unit, with good gender balance and with internationally active researchers. Furthermore, it found a clear strategy of the unit with challenging and important problems studied often motivated by external contacts.

The quality of the research is considered by the panel to be of internationally high standard with elements of top quality activities. Opportunities to reach world leading position on a broader basis are regarded possible. The panel appreciates that the unit is involved in real applications of its methods and software, and it recommends further development towards realistic models involving complicated geometries employing large-scale computation.

The networking of the unit is seen as well developed both regarding local and international connections. The panel endorses the plans for renewal and emerging science that include “Multi-scale analysis”, “High dimensional problems”, “Design optimization and inverse problems”. It believes that serious contributions can be made in these fields.

4.3.2 Physics

Panel 13 notes that physics and astronomy activities at Uppsala are divided into five different departments and concludes that this is largely for historical reasons. It appreciates that all departments are now located at the Ångström Laboratory, but also notes that this does not necessarily lead to interactions. It urges senior faculty to actively promote such interactions. The panel endorses the plans to reduce the number of physics departments to two and believes that this should soon be followed by a complete combination of the five departments.

The panel found that the physics research groups are highly interactive both within Sweden and in the international community. It appreciated excellent presentations by talented female young scientists, but notes that female representation in permanent faculty is quite low. The panel believes that fully funded faculty positions covering both research and teaching would make the working conditions at the University more attractive, in particular for female researchers. More well defined career paths to permanent positions are also expected to be more attractive for female candidates.

The panel strongly endorses the idea of the Centre for Accelerators and Instrumentation (CAI), which, as the panel expresses it, would capitalize on a strong tradition but also represent renewal looking at the on-going instrumentation projects by very talented people. In this context, the panel notes that Sweden is in a special situation as it does not have equivalents to many foreign countries' research institutes where such highly specialized equipment can be built, and that CAI could make Uppsala provide a unique resource for the country as a whole.

The importance of developing an adequate computing infrastructure is underscored by the panel, as there are many activities in the departments that depend critically on the access to powerful computational resources. It states that a computing infrastructure should be developed as a hierarchical facility, where local resources, department services, nationwide and international grid-type solutions are in balance.

The panel comments, as do many other panels, on the distribution of teaching vs. research for different categories of researchers. It also raises some concern regarding questions of critical mass in different activities, and suggests that a prioritization process be implemented. Another addressed issue concerns the availability of technical assistance for the physics departments, which has been strongly reduced over the years. The sophistication of modern physics equipment implies that graduate students and faculty cannot generally take on these duties at a sufficiently high level without seriously hampering their time for creative research.

Department of Theoretical Physics

In the Department of Theoretical Physics, panel 13 identified research that has had enormous impact in the field of string theory, obviously of world-leading quality. Other areas of research at the department were also assessed to be first rate and to have international impact.

The panel was concerned about a tendency that professors leave after a few years. It recognizes that this may be a sign of high quality of individuals but it underlines that it is important to make positions more attractive, e.g. by distributing teaching load in a different way.

The panel makes comments that the department shows excellent international collaborations and interactions; that it has world-class junior faculty; the interaction locally is less developed, which could be remedied after a department merger; that it recommends upcoming hires to open up directions related to phenomenology that are more linked to experimental activities at Uppsala.

Department of Nuclear and Particle Physics

Panel 13 splits the Department of Nuclear and Particle Physics into two: *Nuclear Physics* and *Particle Physics*. It also comments specifically on the *Energy resource activity* in the department.

Nuclear Physics

The panel recognizes that the nuclear physics group assumed a leadership role in the previous LEAR program at CERN, and that it was involved in research of internationally high standard regarding near-threshold meson production at the CELSIUS storage ring. After the recent closing of the national laboratory in Uppsala, the group is now preparing for experiments at COSY in Jülich and GSI in Darmstadt.

The panel finds a satisfactory infrastructure in terms of personnel composition, but for the future it requires that suitable fillings of upcoming senior positions be made. The panel underlines that the four collaborators presently involved in the electron cooling development should be transferred to the Centre for Accelerator and Instrumentation. International collaborations and interactions are well developed through various European engagements.

Particle Physics

The panel notes that the group of Particle Physics has strongly focused its future research on well thought-out choices of activities within two world-leading international programs; the ATLAS high energy physics collision experiment at CERN and the ICECUBE neutrino detector for astrophysics in Antarctica. The panel finds that the Particle Physics group collaborates in world-leading international research projects, and that it has good balance between accelerator-based physics and astrophysics. The strong engagement in experimental systems has a long tradition and it is considered being optimally

exploited and maintained, and the initiative concerning the Centre of Accelerators and Instrumentation is again applauded. The panel notes that the sub-groups are fairly small with respect to the ambitious goals, and that it might call for reinforcements and increase in collaborative activities.

The degree of international cooperation is traditionally very strong, for obvious reasons. The panel is also pleased with the national collaboration assuming a leading role. The local interaction between experimentalists and theorists is also regarded as excellent.

Energy Resource Research

The energy resource research within the department of Nuclear and Particle Physics focuses on the world supply of oil and natural gas. The panel notes that the group is active in the International Association for the Study of Peak Oil and Gas and has organized its first international conference. It is suggested that this activity might find a more suitable environment in the merged physics department or in a Centre for Energy Research, if such a unit is created.

Department of Neutron Research

The panel finds that the Department of Neutron Research is the smallest physics department and it focuses on applied nuclear physics research with direct relevance for nuclear energy. The work is carried out in close contact with Swedish nuclear power industry, and it is directed towards e.g. safe spent fuel handling and materials diagnostics. There is also international engagements, e.g. at JET for fusion related research.

The research is considered to be of national importance and holds internationally recognized standard, especially in the fusion physics community. Besides the excellent collaboration and interaction with Swedish nuclear power industry, there are well recognized contributions to European and world-wide nuclear energy and especially fusion related projects. The panel finds it to be to their credit that they derive much of their funding from outside sources.

Recommended measures for successful development include closer collaboration with energy-related research at the Department of Physics, and expanded activity in accelerator driven nuclear power systems at specifically mentioned facilities is suggested as a means of renewal.

Department of Astronomy and Space Physics

The panel finds outstanding competence and enthusiasm at all levels in the Department of Astronomy and Space Physics. It identifies activities of world-class quality and world-leading status, especially in the field of spectroscopy of low mass stars. The search for extra-solar planets has made this activity highly interesting, and planetary research, within as well as outside our solar system, is a specialty of the Uppsala group. Other activities of high quality concern e.g. numerical modeling of stellar atmospheres. The collaboration

with the Space Physics Institute is positively noted, as well as various international collaborations.

The panel endorses the department's plans to focus on three activities: extra-solar planets, low-mass stars and galaxy formation. It notices that also this department benefits from the newly started Centre for Accelerators and Instrumentation as development of better instrumentation is a key strength with international recognition.

The panel sees opportunities for renewal in two new initiatives; the establishment of a Centre for Advanced Studies of Planetary Systems and the development of a new group based on the Swedish solar telescope on the Canary Islands. Caution must be exercised, though, to secure enough financial means not to impinge on existing activities or other future developments. The plan to build a planetarium in Uppsala is supported by the panel.

Department of Physics

The panel notes that the Department of Physics has a particular strength and tradition in developing new instruments and associated spectroscopic techniques and application areas. Synchrotron radiation plays an important role, and it is noted that this department plays a key role in the development and pursuit of the MAX-lab national laboratory in Lund. Furthermore, the panel notes that a further strength is theoretical modeling in condensed matter physics and in other disciplines. The panel also points out the activity in the didactics of physics, which it considers a unique research focus in Sweden.

The local as well as global collaboration is regarded as excellent, and the extensive use of major international experimental facilities is appreciated. The panel suggests that the administrative structure as represented by the Physics I-V programs, the Theoretical Magnetism and the Physics Education Research be organized into groups more representative of the actual subject divisions, e.g. magnetism, interfaces and low-dimensional materials, energy related materials, experiment methodology, theoretical modeling molecular and soft matter, and physics education.

The panel underlines the necessity to make carefully selected hires when present senior faculty retires in the years to come. It is stressed, though, that entering new areas should not stretch personnel and laboratory resources too thinly over too many projects. In the area of theory, the panel welcomes new initiatives in method development. It regards filling the upcoming vacancy by a hire in many-body theory a positive step.

4.3.3 Chemistry

Panel 14 finds a number of research activities of very high quality in different fields of chemistry at Uppsala University. It chooses to discuss actions for successful development in the framework of Chemistry as a whole at the university. It proposes a number of strategic measures to help Chemistry become

even more competitive, attract more students and increase its international visibility. The first recommendation is to streamline the administrative structure in order to maximize flexibility and effectiveness. The second measure proposed is to install two new international MSc programmes in order to attract additional students by aggressive promotion internationally. Two further pieces of advice concern the forming of mentoring committees for junior faculty and to provide seed money for new cooperation.

The panel also discusses whether the theoretical chemistry and modeling activities that are of high quality and dispersed in various departments and programs should be organized in a more central structure in order to optimize its resources and performance.

Department of Biochemistry and Organic Chemistry

The panel was impressed by the quality, breadth and depth of the science as well as of the local and global interactions and the suitable age profile of the Department of Biochemistry and Organic Chemistry. The quality assessments for research at the department yield ratings ranging between the two highest levels, with world leading labels for the senior scientists. Regarding networking and collaborations the panel states that they are satisfactory.

The department is in a phase of renewal, and it is the opinion of the panel that one should work towards reaching critical mass in the different activities. Enhanced collaboration between the groups is necessary to fully take advantage of the technologies used. The department is regarded as ideally placed for an international MSc course in chemistry.

Department of Photo Chemistry and Molecular Science

The new Department of Photochemistry and Molecular Science was commended for its multidisciplinary approach in the endeavor to unravel the elementary steps of the photosynthesis process, more specifically on the generation of hydrogen from water and light. The panel found a good balance with respect to staff categories and gender. The quality of the research was considered to be very good with senior members in world leading class. Regarding networking and collaboration, the panel concluded that it is exceptionally good, locally as well as internationally.

The panel suggests that an international master's program in the area of energy chemistry would be an attractive option to increase the student base.

Department of Physical and Analytical Chemistry

Physical Chemistry

The panel concludes that the unit of Physical Chemistry is in a transition period and assessments are therefore more difficult. It notes, however, that these units more than others offer opportunities for renewal within the framework of chemistry in Uppsala. The panel found research at internationally high level as well as on internationally recognized level. Questions regarding location

suitability of groups are discussed, as well as delocalization vs. centralization of theoretical modeling. The panel considers a possible concentration of modeling activities to be a hidden strength at Uppsala, and the upcoming vacancy in theoretical chemistry is regarded a key component.

Analytical Chemistry

The unit of Analytical Chemistry is considered to show an optimum balance between fundamental and applied research. The panel concluded that the research related to liquid separations and mass spectrometry in life sciences is of internationally high standard. The panel is concerned that in order to safeguard the continuity of the high quality of research, the necessary steps to fill the current vacant chair should be taken.

Surface Biotechnology

The unit of Surface Biotechnology is stated to be well equipped and to have developed a number of powerful techniques and methods with high practical relevance. The research is regarded as being of internationally high quality and of great impact. Cooperation is well developed, also with industry. The panel sees a clear link to analytical chemistry and potential for an important role in a future biomolecular separation and analysis unit. The vacant chair is considered a potential strategic tool in optimizing the profile of such a new unit.

Department of Materials Chemistry

The panel points out that this department, which is the largest one in chemistry, hosts a variety of expertise and that it is responsible for a large part of chemistry teaching. It states that the infrastructure is excellent, and it finds high quality research, e.g. in the polymer science unit and also several opportunities to contribute significantly to forefront science, such as battery research. The panel endorses the profiling towards functional materials on all scales as initiated by installing several groups with young research leaders. Collaborations and networking are considered well-developed and one suggests further enhanced collaboration with materials science in the physics section.

Opportunities for renewal are noted to exist and should be used to strengthen Materials Chemistry in Uppsala. The two chairs that will become vacant in a couple of years are key elements in this process. Decisions on these will define new research lines and one should carefully consider suitable combinations of research groups to reinforce the renewal process.

4.3.4 Biology

Department of Bioorganic Chemistry

Panel 15 assessed the research at the Department of Bioorganic Chemistry, which is the smallest biology department, to meet internationally high standard. The department is noted for its structural studies using high-field NMR spectrometry. The panel felt that future demanding studies would probably require instruments at other laboratories as the in-house instruments will not be competitive. The department is part of various national and international collaboration networks, and it is considered to be well placed for assuming a role in developing new methodologies in RNA and DNA biology. As to actions for maintained quality and successful development, the panel asks for a definition of future directions that takes more account of problems studied by other groups locally.

Department of Cell and Molecular Biology

The Department of Cell and Molecular Biology, one of the biggest with six research programs and about 115 staff members, was characterized by panel 15 as well managed and well-performing, although also here one thought there was room for improved synergies between the programs and even between groups of the same program. Three of the programs were considered pursuing research of world leading quality, namely Structural Biology, Biophysics, and Molecular Biology. Other programs were assessed to be performing at internationally recognized to internationally high level.

The research environment is regarded to offer good seminar programs, and the RNA centre network seems beneficial for local collaborations. Still, the panel sees potential for improvement in this respect. International collaboration is at a good level with participation in various EU networks and joint international funding and frequent international visitors.

The panel discusses actions for successful development in terms of funding, recruitments and relocation and points at some activities with crucial needs. Relocation is suggested in a few cases motivated by conditions of sub-critical mass or sub-optimal environment.

Department of Evolution, Genomics and Systematics

The Department of Evolution, Genomics and Systematics is praised by the panel for the way it nurses collaboration and obtains synergies between programs. Furthermore, the premises, facilities and joint seminar programs and strong postdoc training are commended in mentioning their role for the success. The panel identifies two of the programs to be performing at top quality/world leading level, namely the Molecular Evolution and Evolutionary Biology programs. The other three programs are considered to be of internationally high or internationally recognized standard.

The research environment is considered to be very good, and strong encouragement to develop shared facilities is judged to ensure that work is undertaken most efficiently and with appropriate expertise. Networks are seen to be well developed and functioning both locally and internationally. Finally, the planned actions for successful developments presented by the department were entirely endorsed by the panel, including the merger of Systematic Botany and Systematic Zoology into a single program of Systematic Biology.

Department of Physiology and Developmental Biology

The Department of Physiology and Development Biology was found by the panel to be relatively heterogeneous. It therefore concluded that there was potential for development of synergies between its sub-departments and also with respect to other departments. This was considered particularly true for junior researchers in the sub-department of Developmental Biology and Genetics in addition to the existing outstanding international network. The panel finds that top quality or world leading standard is met for two of the sub-departments, Development Biology and Genetics, and Evolutionary Organismal Biology, whereas the other two sub-departments perform at internationally high to internationally recognized level.

The panel considered the infrastructure in this department to be very good. Renewal opportunities exist, especially in Environmental Toxicology where three faculty and junior faculty positions are to be recruited shortly. According to the panel, a reconsideration of the composition of the department might be part of actions for successful development.

Department of Ecology and Evolution

The panel considers the Department of Ecology and Evolution, one of the biggest with 110 staff members, to be coherent and to offer research education in a collaborative environment. The plans to get all programs physically located at the EBC are strongly endorsed. The panel identifies work of very high standard, for the work on plant adaptation approaching world leading level, and other activities are assessed to be of internationally high to internationally recognized standard.

The panel commends the EBC as a competitive research platform that offers a unique basis for training and cutting edge research. It particularly values the infrastructure that allows for integration of molecular tools into ecological and population biology research. The programs have good networks and collaborations at national and international levels. As mentioned, the physical merging of all programs will strengthen the local collaboration and facilitate the use of molecular tools.

The Linneaus Centre for Bioinformatics

The Linneaus Centre for Bioinformatics was evaluated by panel 15 (Biology) as well as panel 18 (Information Science and Technology). The biology panel assessed the centre to perform at an internationally recognized level, and it emphasizes the work in computational genetics as particularly exciting. The staff composition is considered suitable; the centre is well connected to national facilities for large scale computing, and it is well set regarding national and international networking. The panel considers the centre to be a core activity with great potential as there is an urgent need for improved database integration and tools for data access. It also states that in order to be successful, the centre should be sensitive to the needs of the local biological community.

Panel 18 expresses its view on measures needed to further develop the Bioinformatics centre. It considers the centre to be an activity of central strategic importance. Therefore, the panel points to the need of finding a long-term place for the centre.

4.3.5 Earth Sciences

Department of Earth Sciences

Panel 16 considers the Uppsala department to be one of the most complete academic institutions in Europe, as it comprises such a broad range of sub-fields. It characterizes the department as solid and internationally well recognized, finding itself in a phase of positive development. A few activities are regarded as world-leading. This applies to activities in Paleobiology, Explosion Seismology, and Electromagnetic Geophysics. Meteorology is given a quality rating between internationally high standard and world-leading. A number of other activities are of internationally high standard according to the panel. In some cases, the panel points to cases where there is great potential for development, but also threats against maintaining quality unless suitable measures are taken.

The panel underlines the importance of conveying to decision makers an awareness of the value of earth sciences to the Swedish society. It recommends that a strategy document be formulated mapping out a programme to improve coordination at the department and strengthen department profile. This document can serve as an initiative and form a link to a national strategy document for the field.

The department is recommended to strengthen collaboration with other Swedish universities, especially for sub-critical groups and activities that lack specific, essential competence. Means to improve research productivity can be found by enhancing cooperation within the department such as by launching a few multi-disciplinary research projects engaging participants from several groups. The panel also found a need for the department to improve the visibility of its research to industry and to develop partnership with companies and organizations.

4.3.6 Engineering Sciences

Department of Engineering Sciences

In reviewing the Department of Engineering Sciences, which constitutes an entire section of the faculty, panel 17 observed that this department attracts considerable external funding. The panel also identified a number of research activities that it considers to pursue top quality work, such as the research activities on Spin glasses, Electro-Chrome Materials, Thin Film Separation Modeling, Electricity Generation Systems, Mass Spectroscopy and Tribology. Furthermore, the panel regards the large number of start-up companies emanating from the department in recent years as indicative of relevant problem selection and high quality work, although it also points to potential problems in separating company and academic activities.

The panel is impressed by the excellent experimental infrastructure and underlines the importance of building on this in the strategic planning for the future. Comments are provided regarding various activities that are very small-scale. The panel therefore raises concern whether the sub-critical size of operations will allow international competitiveness in some cases, and suggests merger actions. The panel proposes that the mass of the most promising activities be increased with the goal to achieve the level of “European Centre of Excellence”.

The panel points to the age profile of researchers in the department with several senior scientists soon to be retired, which calls for the formulation of strategic plans. In this context, one identifies a number of opportunities for renewal. There is, according to the panel, a need to recruit young talents, preferably from outside Uppsala, to fill upcoming vacancies in the same field or in other fields according to the results of the strategic planning. The panel is concerned that retirement sometimes seems to be used as a savings instrument rather than as a tool for renewal. As many other panels in this evaluation, this panel finds that the financial system is too inflexible and tends to hamper change and development.

Other comments concern the question of forming an engineering faculty, a proposal that the panel finds in order; it notes that the names of activities are sometimes non-descriptive or possibly misleading; it suggests that cooperation with the Physics Department be strengthened; it notes that national and European collaborations could be expanded; it is concerned that Ph.D. students sometimes have difficulties in finding appropriate courses, and that there seems to be lacking incentive to develop such courses.

4.4 Medicine and Pharmacy

The research in this disciplinary area was reviewed by six different panels: 19. Pharmaceutical science, 20. Pre-clinical sciences, 21. Social medicine, 22. Clinical sciences, 23. Neuroscience, and 24. Genetics and Pathology.

Generally, research activities were graded according to the recommended quality rating, although there are exemptions where panels have applied their own quality scales. Comments on research environment and infrastructure often concern sub-critical group size, exploitation of synergies and collaborations between groups, locally and globally. Also, infrastructure, access and organization are addressed in several cases.

4.4.1 Medicine

The panels identify a number of research activities of very high or world-leading quality, and also quite a few of high and recognized international standard. Activities that fall short of high standard are often commented on in terms of impediments for successful development, such as issues regarding sub-critical group size, fragmentation and lack of interaction between research groups, as well as lack of focus and strategic planning. Other comments concern money allocation, e.g., that the ALF money allocation should be more based on competition; that career counseling is needed to identify those with good research potential.

Department of Medical Cell Biology

Panel 20 concludes that the Department of Medical Cell Biology is carrying out research of very high quality, although the overall quality appears uneven. A main activity is in the area of diabetology, regarded as of high international standard, with the insulin secretion research particularly appreciated. However, the panel considers the research profile to be too broad and recommends more focus on key issues, as well as improved local and international collaboration. Other activities in this department include research on respiratory, kidney and gastrointestinal diseases, and in this context the panel raises the question of whether an integrated department for physiology and pharmacology would be beneficial for the medical faculty. The research environment is considered to have a good focus on diabetes and hormone secretion research, but other areas seem to suffer from sub-critical mass or insufficient funding. The panel draws attention to a pending retirement that calls for consideration.

Department of Medical Biochemistry and Microbiology

Panel 20 considers the Department of Medical Biochemistry and Microbiology to be an excellent and well-administered department with good senior/junior and gender balance. Although there are several small groups with diverse interests, many of these collaborate in a constructive way. Substantial collaboration with industry has contributed to funding of research in the de-

partment. The panel judges the quality of research in this department to be high, including world-leading status in some cases, such as for the Glycobiology research and activities in Functional Genetics. Recommendations point to the need to fill vacancies from upcoming retirements in a way that complements and underpins ongoing research, rather than populating completely new areas of investigation.

The panel brings up the idea that this department possesses such high standing in its research that it might lend itself for a Centre of Excellence focusing on a specific area. Glycobiology would be one candidate area for such a centre, according to the panel, and others are also mentioned.

Panel 24 also offers comments on research activities in tumor biology and genetics in this department. The panel identifies the presence of established scientists producing good science as well as young promising researchers, the scientific success of which remains to be seen.

Department of Public Health and Caring Sciences

Panel 21 regards the focus of the research in the Department of Public Health and Caring Sciences to be “of enormous societal interest, growing recognition and a large scientific as well as applied potential”. It identifies a number of strengths possessed, primarily concerning databases and longitudinal studies. Furthermore, it finds research quality of activities ranging from high international standard, the bioethics centre being one unit with particularly high appreciation and a “golden nugget” candidate, to acceptable standard.

A number of issues likely to be relevant for further quality improvement and renewal in the department were stated. Among those, some lack of conceptual framework and strategic planning was mentioned. It was suggested that synergies be sought between research groups, given that different groups had similar themes. The panel addressed the relation of the department’s work within the political arena as a potentially important point. It strongly endorsed appointing a research director to take a lead in developing an overall strategy and a quality management program.

This department was also reviewed by panels 22 and 23, focusing on clinical nutrition respectively on geriatrics. The report given by panel 22 is limited to stating that the new department head shows promise and that the department is involved with societally important issues. Panel 23, which focused on geriatrics, on the other hand, observed an enthusiastic attitude in a well-focused unit enjoying synergies between the different groups. It assessed the quality of research to be of very high international standard, and it saw potential for breakthroughs in diagnosis and treatment of neurodegenerative disorders. It recommended closer coupling to the department of neuroscience.

Department of Women’s and Children’s Health

Panel 22 reviewed research activities in a number of departments involved in clinical sciences, among them the Department of Women’s and Children’s

Health, which it found to be composed of many separate groups. The panel reflects on whether some activity, like Paediatric inflammation, which it finds exciting, would be better located in a more general department with common interests. It is noted that due to the demographic profile, there are a number of upcoming vacancies that could create opportunities for reorganization and regrouping of the department.

Panel 22 uses a scale of their own to assess research quality, which it combines with bold font style in order to express its assessments as a combination of quality and potential. The way the site visit was eventually organized gave limited time for the panel to meet each and every one of the many groups of the departments assigned to this panel. This is reflected in the report, which presents a fairly brief exposition of assessments according to the method mentioned. The report identifies research of very high quality, such as International Maternal Health and International Child Health, and it comments on promising activities of young researchers.

Department of Oncology, Radiology and Clinical Immunology

As for several other departments, panel 22 makes the comment on Department of Oncology, Radiology and Clinical Immunology that it is composed of many disparate groups. Although the panel finds it difficult to understand the rationale behind it, it finds research of very high quality among the groups, in particular the clinical immunology activity, which it considers as a “golden nugget”. It notes the high strength in imaging, and it comments on its concern with the sale of the PET centre.

Department of Surgical Sciences

In their review of the Department of Surgical Sciences, panel 22 was impressed by the high quality of many of the research programmes. Among the 13 research units of the department, there were several that received high grades on the self-invented scale of this panel, the highest being given to Endocrinological Surgery and Orthopaedics. Some activities showed less impressive publication output in the eyes of the panel and seemed to suffer from limited funding or other hindrance for successful development.

Department of Medical Sciences

The Department of Medical Sciences, composed of many different research groups appeared to Panel 22 to be organized in a way that duplicated certain efforts. It was suggested that amalgamation would be a way to go ahead with organization. The panel identified a few outstanding or high quality activities, and for example endocrine oncology and endocrine tumor biology were mentioned. Increasing collaboration with like-minded groups and seeking opportunities to share expensive resources were mentioned in several cases as means of developing research. The different activities were assessed by the panel in a brief way, owing to the very many small groups that were included

in this panel's review. Although a quality/potential rating (according to the panel's own scale) was given for all groups, the amount of information offering advice for development is unfortunately rather limited.

Panel 24 evaluated two technology platforms of the Department of Medical Sciences, the SNP Technology Platform and the Expression Array platform. Both platforms are recognized by the panel to be well networked and have strong collaborations on campus, nationally and internationally. Furthermore, the two platforms are said to be true intellectual core facilities, lead by scientists who have a strong research activity.

Department of Neuroscience

Panel 23 notes that the fusing of a number of basic science and clinical departments into one, the Department of Neuroscience, has created a situation of extreme diversity. Although the panel sees this diversity as a potential for creating multidisciplinary constellations, it thinks this has been realized only to a limited extent, positive examples being traumatic brain injury research and feeding behavior and obesity. The panel rates the activities in clinical neurophysiology, developmental genetics, neurotrauma research, and pharmacology to be of high international standard.

The panel considers neuroscience in Uppsala at present to be too diverse and in need of defining a strategy that helps focus in this competitive field. It takes note of the fact that there are upcoming vacancies that bring opportunities for renewal in the research area. Furthermore, it identifies a need to develop the research infrastructure and to promote common use of expensive equipment, as well as core facility functions in specialized areas. It recommends focusing on a few thematic research areas as a way to define a strategy for the future, and as an example, it gives research on feeding behavior and related disorders.

Department of Genetics and Pathology

Panel 24 stresses that it saw extraordinary high level of science in the Department of Genetics and Pathology. The breath of high quality research impressed the panel, which had no doubt that many of the groups represent international top quality. The molecular tools activity and the human protein atlas project were mentioned in this category. No activity in this department fell short of internationally high standard according to the panel.

The panel comments on problems associated with the lack of a tenure track system. It also points to the problem that some of the younger PIs (principal investigators) are not easily recognized as independent scientists by funding agencies, although it is clear that such innovative research needs a critical mass of sufficiently experienced scientists. Regarding actions for successful development, the panel suggested counteracting fragmentation tendencies by relocating activities, and it pointed to the development of institutional support for core facilities as a matter of importance for future success.

Ludwig Institute for Cancer Research

Panel 24 praises the research at the Ludwig Institute as one of the best in the world of its kind, and it states that the scientific production of the Uppsala institute is superb. One of the unique aspects of the Uppsala Ludwig branch is said to be the combination of top class research within one unifying theme with very good research training. The panel appreciates the way the institute can stimulate the University environment to adopt some of its strategies and that different structures enrich the academic environment. On the one hand, classic departmental structures facilitate growth of small independent groups and a diversity of research avenues. On the other hand, focusing groups around large themes, as done at the institute, provides opportunities for significantly advancing the field. The panel takes note that external recruitment is dominating at the institute, as opposed to the university.

4.4.2 Pharmacy

The research in the faculty of pharmacy was reviewed by panel 19. The panel identifies activities of excellent quality and innovative research, as well as areas in need of renewal in order to meet important missions of this faculty. Some impediments to fully realizing the faculty's potential are mentioned to exist in terms of non-optimal support allocation and career planning. Also, the potential for interaction within and outside departments, as well as across faculties was considered not fully developed. The panel wanted to see a faculty-wide strategic longer-term planning as well as succession planning in some case.

The research environment and facilities for Ph.D. students and young scientists was generally found to be good by the panel. Career opportunities with secure continuity was mentioned as a concern here as in many other departments at the university. Furthermore, the panel recommends investments in general facilities, such as high-level computer facilities and advanced analytical instruments, and it underlines that such efforts be made in a way that makes them widely available and promotes collaboration.

Department of Pharmaceutical Biosciences

The panel concurs with the strategic view of the Department of Pharmaceutical Biosciences that pharmaceutical informatics and neuropharmacology of drug addiction are two areas of vital importance for the future. It wants to add one area, that of drug safety, including research of pharmaceutical nanocarriers. The panel suggests that increased collaboration between the groups in proteochemometrics and pharmacometrics would be beneficial to the research in pharmaceutical informatics, and it endorses the plans for model-based research in this field. The panel considers the research in drug addiction to have great potential and to be of top quality including world-leading expertise in the study of opioid transport by various methods. The research in drug metabolism

is appreciated by the panel to be of high standard, but is suggested to be carried out in closer collaboration between the different groups engaged in this field.

Department of Pharmacy

Research in the areas of social pharmacy and pharmacy practice is conducted in two groups in the Department of Pharmacy, and issues regarding critical mass and scope of interests are mentioned by the panel. It is recommended that the groups focus and concentrate on their strengths, and also that they collaborate and seek strategic collaboration in the faculty of medicine.

The pharmaceutical research activities are assessed to be of high quality and internationally recognized. Actions for renewal endorsed by the panel, aiming at improved external funding, include development of pharmaceutical physics expertise such as collaborations within materials science, and also improved theoretical framework for solid dosage forms design and processing.

Biopharmaceutics research has a clear international standing according to the panel, and it enjoys adequate funding from industrial and public sources. Strengthening of activities is endorsed by the panel. The panel commends the group in drug delivery research for its efforts to focus on its strengths, and it notes that this group has a high international standing. It also considers the physical chemistry research to be a new promising activity that needs time to flourish.

Department of Medicinal Chemistry

In reviewing the Department of Medicinal Chemistry, the panel recognizes the long tradition of excellent research in the area of pharmaceutical and biomedical analysis, though it notes an output decrease during the last years. Among the initiatives at hand for renewal and increased external funding, a clear choice of direction is advocated by the panel and a suggested field is metabonomics including biomarkers. The panel suggests that pre-emptive appointment action should be considered.

The panel regards pharmacognosy research as having a wide scope of activities that might be somewhat concentrated. Increased interaction with analytical pharmaceutical chemistry is encouraged.

The organic pharmaceutical chemistry division is considered to be a strong unit with impressive output and balanced scientific and applied activities. The panel endorses the plan to strengthen the group by two new professors, but it suggests alternative research specialty and underlines the importance to find a successor who can take over the leadership of the large research group.

5. Bibliometric study

5.1 Introduction

As mentioned in Part I the bibliometric analysis was conducted as a separate exercise, and the results were not available to the panellists. There were several reasons for this. One was not to bias the panels and another was related to the differences between disciplines in terms of publication traditions, which lead to varying applicability of bibliometry. Although the panel evaluation was not based on bibliometrics some panels commented on its use. One HS panel thus declared:

As part of the Quality and Renewal process a bibliometric study is undertaken by external expertise. A bibliometric analysis is a productive tool to measure research outcomes, channels of scientific publication, impact, research collaboration etc. However neither existing international nor national databases opens for sound bibliometric studies of scientific productivity and quality in non-English speaking countries, nor in non-English scientific publications. The existing databases do not account for different traditions of scientific publications. This is especially the case in areas of humanities and social sciences. (HS Panel)

Also a ST panel made a comment regarding the publication practices in information technology, where conference proceedings are regarded very important:

We are concerned that when only journal publications are used to evaluate faculty research, one not only gets the wrong picture of [the] research, but faculty are prompted to work along lines that may be less productive than they could be. (ST Panel)

5.2 Methodology

The bibliometric study has been carried out by M.S. Visser and A.J. Nederhof at Center for Science and Technology Studies (CWTS) at Leiden University in the Netherlands. The basis was the publications available in the Web of Science version of the Science Citation Index (SCI), the Social Science Citation Index (SSCI) and the Arts & Humanities Citation Index (A&HCI).

Data from these were extracted for the period 2002-2006 on the basis of a list of researchers with department affiliations, active at Uppsala University on September 26, 2006. In addition a check for consistency with the Uppsala University OPUS database was made.

In the bibliometric analysis a number of indicators were generated. The basic indicators were the number of articles published (P) and the number of citations recorded (C). These were then used to generate figures regarding average number of citations per publication (CPP) and percentage of articles not cited (Pnc). In order to put the citations figures into context they were related to two reference values: (1) the average citation rate of all articles in the journals in which the research unit is active (JCSm) and (2) the average citation rate of all articles in the subfields in which the research unit is active (FCSm). The relationship between a department's average citation rate (citations per paper, self-citations excluded) and the first mentioned reference value provides an index for the relative impact of its research in the journal set (CPP/JCSm). Correspondingly the relationship between the citation rate and the second reference value (CPP/FCSm) gives an index in relation to the research field. Scores of unity for these two indicators thus means that the department's papers have been cited at the same rate as the world average for the journal set and for the field(s) in question, respectively. A score of e.g. of 1.3 means that they have been cited 30% more.

In order to be able to generate these normalized citation scores, a certain minimum amount of publications subject to being indexed in the Web of Science databases is required. Many departments in the faculty of Social Sciences and all departments in the Humanities publish in a way that does not generate enough indexed publications in the databases to allow a statistically significant citation score to be calculated. This is mainly a result of differences in publication outlets (see below) and limitations in the data bases. It is therefore important to recognize that absence of departments in the results of the bibliometric study does not say anything about the quality of the research. Also, caution should be exercised for departments with low number of indexed publications.

5.3 Results

The bibliometric study shows that the number of Uppsala University publications in the period of 2002-2006 was almost 20,000. Of these a bit more than 40 per cent are in the Web of Science databases. These articles are to a dominating extent published by scholars in the disciplinary areas of Science and Technology, and Medicine and Pharmacy. Researchers in the Humanities and Social Sciences (including Educational Sciences) on the other hand have larger shares among non Web of Science articles, book chapters, books, edited books, reviews and book reviews. These differences in publication practices

are illustrated in figure 5.1. Note that the numbers for Ph.D. and Lic theses only account for theses by individuals who were employed at Uppsala University in September 2006, which is the general requirement for this study.

The number of Web of Science publications was 8,502. These obtained 45,209 citations, self-citations excluded, i.e. on average they were cited 5.32 times. One third of the publications had not been cited at all, while 228 papers belonged to the five per cent most cited papers in their field.

The impact of the research in relation to journal sets was 1.06 for the University as a whole, i.e. Uppsala researchers had a 6 per cent advantage to the world average. Above the University average were Social Sciences (1.25), Mathematics and Computer Science (1.17), Medicine (1.08), Chemistry (1.08), Earth Sciences (1.07) and Engineering (1.07), while Pharmacy (1.05), Biology (1.01) and Physics (0.89) were below.

Using the average impact in relation to the research field Uppsala researchers came out even better. The index was found to be 1.25, a 25 per cent advantage of Uppsala scholars. Above the University average were Biology (1.36), Chemistry (1.35), Engineering (1.35) and Social Sciences (1.26) and below Medicine (1.22), Physics (1.17), Mathematics and Computer Science (1.11), Pharmacy (1.11) and Earth Sciences (0.94). For departments with more than 50 WoS publications in 2002-2006 figure 5.2 provides information on the field normalized impact factor, number of publications and citations. The limit of 50 publications was chosen to yield statistical significance.

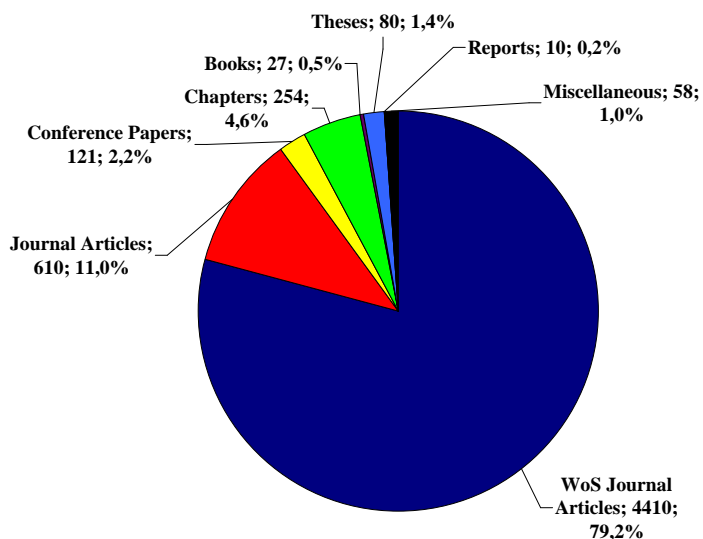
It could also be noted that the Leiden team found that Uppsala researchers are well connected to high quality research groups:

Users of UU knowledge tend to be cited highly themselves. This indicates that UU work is used by researchers of high impact, at the edge of the research frontier. (see Chapter 30.4.3)

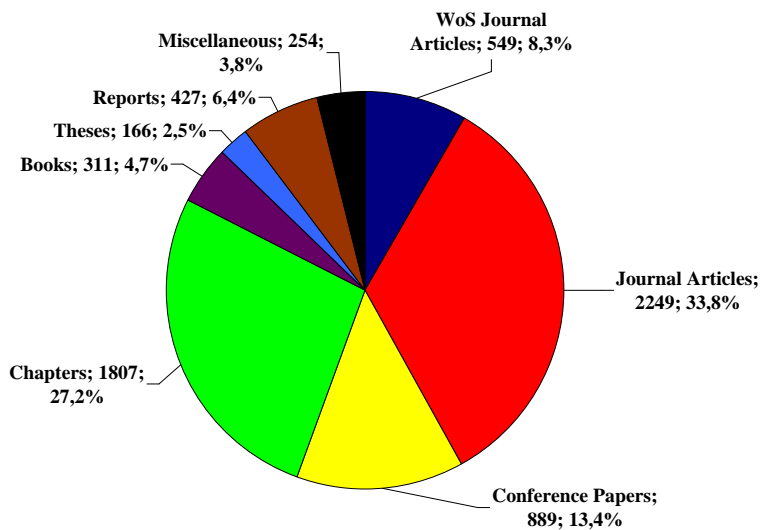
The bibliometric study also shows that Uppsala scholars on average publish in journals that have an impact that is 17 per cent above the world-average. Again there were variations between fields in the University. Above the total average were Biology (1.35), Physics (1.32), Engineering (1.26), and Chemistry (1.25), and below Medicine (1.13), Pharmacy (1.06), Social Sciences (1.01), Mathematics and Computer Science (0.95) and Earth Sciences (0.88).

In interpreting the presented results it should be kept in mind that the number of indexed publications in the analysis varies considerably between the disciplines. It varies from 340 for Earth Sciences to more than ten times as many (3,556) for Medicine.

All in all, the Leiden group presents a positive picture of the impact of Uppsala research and they conclude their report by stating:

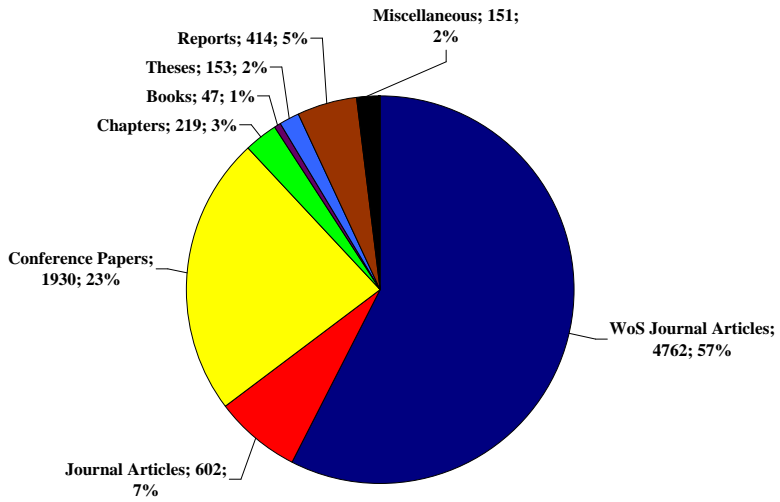


(a) Publication types for Medicine and Pharmacy 2002-2006



(b) Publication types for Humanities and Social Sciences 2002-2006

Figure 5.1: Publication types at Uppsala University 2002-2006



(c) Publication types for Science and Technology 2002-2006

Figure 5.1: Publication types at Uppsala University 2002-2006 (continued)

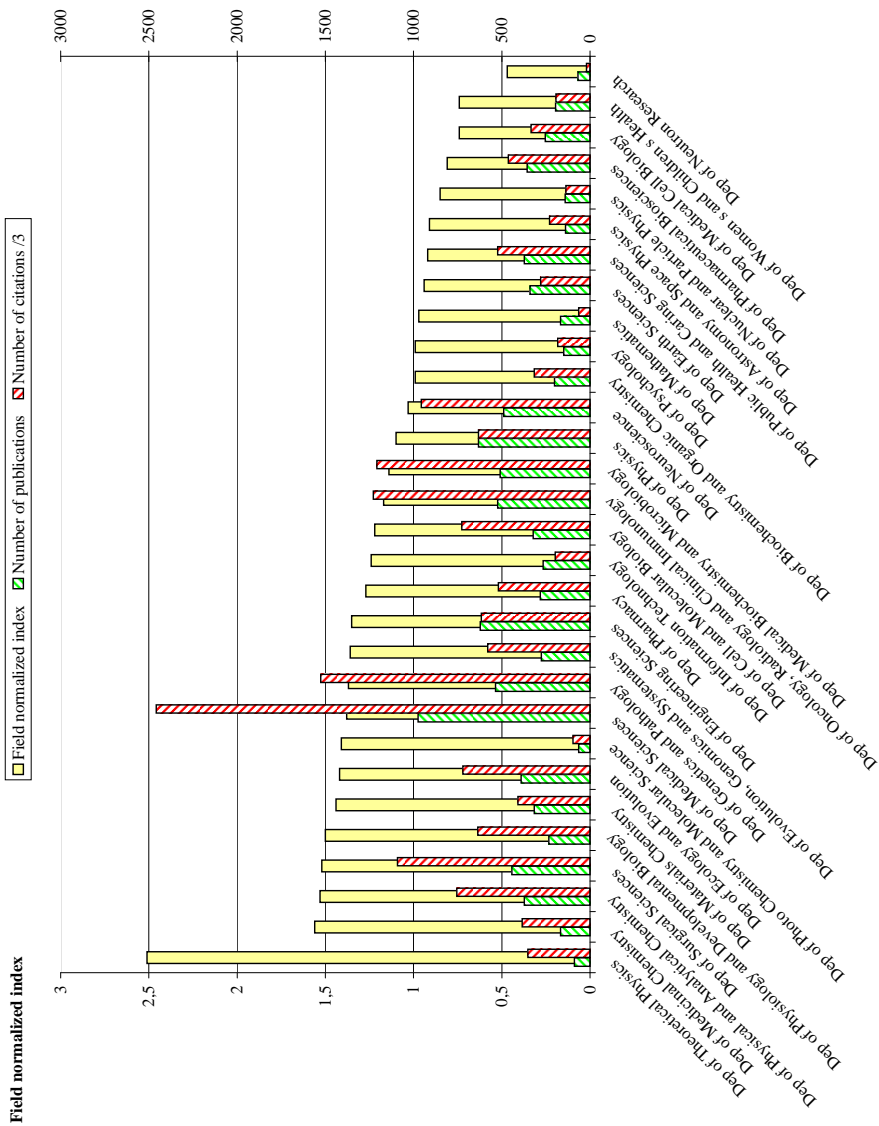


Figure 5.2: The diagram shows Field normalized citation index, along with number of publications and number of citations, for departments with at least 50 WoS publications in the years 2002-2006.

UU researchers contribute substantially to international scientific networks, and many receive a sizeable part of their impact from publications that are internationally co-authored. (see Chapter 30.8)

It should finally be noted that before concluding the authors of the report provide a few caveats. First, they state that quality can only be evaluated by peers, based on detailed insight into content and nature of the research con-

ducted. In their view there is not a clear correspondence between impact and scientific quality. They therefore point out that bibliometrics and peer review conclusion may differ. Reasons for such differences may be for instance classification of journals into subfields. Such problems occur particularly for fast-developing novel interdisciplinary areas.

Second, they point to the coverage of citation indices, which for certain areas may be less adequate. They therefore mention the need to also take into consideration publications that are not or no longer covered by the data bases.

Third, they mention the problem of time delays, which may differ between research fields:

It may take several years for a collection of papers to generate a high impact. We have analyzed research units that generated only a moderate impact at a time. When we updated the results after a few years, several research units showed a sharply rising curve. (see Chapter 30.7)

Fourth, they point to other uncertainties due to the limitation of the population of researchers.

These caveats should of course be kept in mind in reading the Leiden report. Its authors seem to advise its readers to consider it as a complement to the Panel reports rather than to use its results in isolation.

Part III:
Panel Reports

Panel Reports

In the following chapters the reports from each Panel is included. Most reports were written in Microsoft Word® while this final report is written in L^AT_EX, therefore the reports might differ slightly from the original reports.

Some of the reports have been technically edited to comply with the graphical profile of Uppsala University and the general layout of this report.

6. Panel 1

6.1 Department of Information Science, Division of Statistics

6.1.1 Summary

We conclude that statistical research and teaching be organised at the Faculty of Social Science by merging the most active part of the statistical division, the time series econometricians, with the Economics Department. If deemed useful, it may form a separate unit or division within the Economics Department. This merger may be beneficial to the time series econometricians at the Statistical Division as well as for the macroeconomic researchers and the microeconometricians at the Economics Department.

It is likely that the structural equation modelling group will benefit from being incorporated into the Economics Department jointly with the time series econometricians. There is potential for application of the models in economics, and a department with a strong tradition in quantitative analysis and method would provide a natural home for this group.

We recommend that the university renew its commitment to recruiting a professor of biostatistics to be located either in the Mathematics department or in the same academic division as epidemiology.

6.1.2 General assessment

The Statistics Department in the Faculty of Social Sciences achieved international prominence under the leadership of Herman Wold and Karl Jöreskog. After Jöreskog retired in 2000 the Statistics Department was amalgamated with the Departments of Computer Science, Human-computer Interaction and Media and Communication Studies to form a single Department of Information Sciences. The present report is devoted to the Statistics Division of the Department of Information Sciences.

There are two full professors and five associate professors in the Statistics Division. They consist primarily of former PhD graduates of the University of Uppsala. One full professor and two associate professors are close to retirement. The program also has one post doctoral fellow and four doctoral students, of whom two are overseas for the current year and one is employed outside the university. One full professor, one associate professor and the assistant professor and one post doctoral fellow are actively engaged in research

in multivariate time series and econometrics. They collaborate actively with each other and with colleagues elsewhere in Sweden and in the United States. The formerly prominent areas of structural equation modelling and biostatistics are less actively pursued within the program. Internationally renowned emeritus professor Karl Jöreskog is still actively involved in research in structural equation modelling, but primarily in collaboration with colleagues who are not at the University of Uppsala. Some faculty, and the sole graduate student on campus, carry excessive teaching loads that preclude the possibility of research.

The Statistics division has started the recruitment process of one professor and two lecturers. In addition another chair and two lecturer positions are currently vacant.

6.1.3 Quality of Research

In its self-evaluation document the Statistics division mentions four areas of research: econometrics/time series analysis, biostatistics, structural equation modelling, and geophysics. The areas have also been extensively discussed during our site visit.

In terms of volume, the econometrics/time series group of the division is the largest research group. The group is headed by a professor and contains a good mixture of associate professors down to PhD students. We regard the group to be of internationally high standard. To enhance the renown of the group further, a critical mass in terms of additional PhD students and senior faculty would be required.

The biostatistics group is composed of two lecturers doing full time undergraduate teaching, one professor emeritus and an associate professor who is going to retire July 1. While this group has been of internationally high standard, its current status must be viewed as being of an acceptable to internationally recognized standard.

A similar unfortunate age profile also characterizes the structural equation modelling group. The group and thereby statistics in Uppsala are fortunate to still have a very good international reputation thanks mainly to an active professor emeritus (Jöreskog). Two associate professors and a PhD student in the group all have heavy teaching loads and little opportunity of research. It is our view that this group was of top quality a few years back in time but currently it is hard to assess its scientific standard.

As to geophysics, we understand that work in this area will end after the retirement of its single active member. We therefore find no reason to discuss the current standard and furthering of this particular research area.

6.1.4 Research environment and infrastructure

The age profile of the statistics division is not optimal for research. Senior people who normally provide leadership and ideas have retired without being replaced, and some research areas have suffered. Besides, a part of the faculty appears to be on a long-term sick leave. At the other end of the scale, the division has fewer graduate students than they would have capacity to supervise. In some areas such as biostatistics, there are not enough researchers to form the critical mass essential in conducting successful research. Time series econometrics seems to have the best situation, but even that group must be considered rather small.

The division has experienced a temporary break in seminar activities but is planning to resurrect a biweekly seminar. Most of the speakers have been and will be from Swedish universities. There is only a single seminar series, but typically all faculty members as well as the graduate students are attending the seminars. Recently, there have not been many long-term foreign visitors to the division.

Supervision of graduate students, which is an important part of the research environment, varies from one group to the other. In time series econometrics, the students work within projects and are being supervised on a regular basis. In some other areas, supervision is not very systematically organized, and some students have been writing their dissertations largely on their own.

There does not seem to be much local research collaboration. Time series econometricians do not interact very much with their micro econometrics colleagues at the Economics Department. A somewhat surprising fact is that structural equation modelling group, has little local collaboration. It seems that the other departments of the university are neglecting the research potential of the group. Instead, this group has a wealth of international as well as domestic contacts and collaboration. That the statistics division does not collaborate with the other divisions of the department is understandable, because the others do not have any research interests that they would share with statistics.

Statistics is not a laboratory science, so the demands on the infrastructure are not very large. The infrastructure may be deemed adequate. There is no shortage of offices, and a sufficient amount of computational power appears to be available.

6.1.5 Networks and Collaborations

Connections to other departments and universities are very unevenly distributed among faculty and seem to depend on the individual person. Some persons have a widespread network and are writing papers with well known scholars in other countries, whereas others do not do it at all.

Ph.D students do not receive much support to make their own networks beside the course work. However, there is a possibility to finance their first

conference even without a paper. The number of foreign researchers among faculty is rather small and there are few long-staying foreign visitors.

6.1.6 Opportunities for renewal and emerging science

The Statistics Divisions in the Department of Information Science are divided into the following specialties or groups:

- Econometrics/timeseries
- Biostatistics
- Structural Equation Modelling
- Geophysic statistics

The most active group with respect to research and international publications is the Econometrics/timeseries group. Two broad research topics are covered: timeseries econometrics with the emphasis on unit roots econometrics, and financial econometrics. These types of econometric research take place in many economics department all over the world. The competition in this field is thus fierce and it is difficult to make contributions that get published in top journals. One could either concentrate on making purely methodological contributions or to combine methodological development with applied work. An interesting avenue of new research is to analyze panel data, not only macro economic time series but also micro data (panel data covering individuals and firms). The Economics Department in Uppsala and the IFAU have access to rather micro panel datasets. These data should give the time series researchers at Statistics a broader empirical basis for their applied research.

The Statistics Division in the Department of Information Science is rather small, with few active researchers who are not retired, and it is likely that the time series econometricians as well as the Economics Department would benefit from a closer cooperation and eventually of a merger. This is also the case with the researchers doing financial econometrics. Although this type of econometrics has more in common with unit root econometrics than the current analysis of micro data at the Economics Department, financial econometrics has strong ties to economic theory and may hence benefit from a closer contact with economic research in macroeconomics and finance theory.

With regard to the localization of the Statistic Division there are three options:

1. Retain the current situation or form a separate department within the Social Sciences. The advantage with the latter option is that this unit would be an independent one, with its own PhD programme interacting with Social Science departments as well as other departments at the University, such as the Mathematics Department. The disadvantage is that it may be a small a unit with a high teaching load imposed on its employees.
2. Merge Statistics with the Economics department, eventually organized as a separate Econometrics division within the Economics de-

partment. The advantage of this alternative is that the time series econometrics group already has common research interests with the economics department and a merger may thus benefit both groups. There is no reason why the econometricians in the current Statistics division should not have an opportunity to work on statistical theory under this option. Another advantage is that teaching of statistics and econometrics can be shared with a larger group of teachers. The teaching load of each faculty member could then be lowered, in particular at introductory levels. The disadvantage is that the profile of the divisions as an independent statistical/econometric unit may get lost and that the contact with other departments, the Mathematics Department in particular, could be weakened.

3. Merge with the Mathematics department and the current Statistics division therein. The advantage for research is that the work on statistical theory could be strengthened and the teaching load spread on more teachers. A long-term consequence of such a merger could be less social science oriented research and less subject matter in the teaching of undergraduates.

Structural Equation Modelling is closely associated to the work of KG Jöreskog, who has made so many important contributions to this field of statistics. He has been and still is the world leader in the development of this field that has a variety of possible applications. It is somewhat surprising that the University of Uppsala has not given high priority to keeping this brand name of the university alive. At present there is only one associate professor working full time and another one working half time. Besides, there is only one PhD student. To keep Structural Equation Modelling at the University of Uppsala alive the current Statistics division could be incorporated in the Department of Economics.

It is important that the faculty and students should have a teaching load that leaves plenty of time for research

6.1.7 Actions for successful development

There is an urgent need to replenish and stabilize the faculty of the statistics division. The recent retirement of three full professors along with faculty on sick leave and paternal leave has cast a heavy teaching responsibility onto the available faculty and has infringed on the time available for research to the point of stopping some projects completely. We recommend that these faculty positions be filled and that teaching responsibilities be redistributed so that research can resume for those most affected.

It is our observation that the demands of the amounts of teaching have had a detrimental effect on research productivity. As soon as additional help is available, compensatory time for research should be given to those who have been affected by excessive teaching duties.

A corollary of the above is to define departmental priorities in such a way as to guide recruitment for the open positions. As an example of the need to set priorities, the place of biostatistics in the department and the university needs to be revisited. Currently much of the education of medical students in statistics has been privatized as has the role of statistical collaborators on medical and health related research largely because of cost. The long range separation of teaching and collaboration in biostatistics from its university base is an issue that should be addressed by the Vice-Chancellor in consultation with faculty researchers from the health professions and experienced biostatisticians such as Professor Adam Taube. It is not uncommon for some researchers in the health professions to regard statisticians as technical assistants rather than as collaborators who can push the boundaries of inquiry, including research design and analysis, by guiding collaborators to fit the most appropriate models to clinical realities under study.

Historically the Department of Statistics has had a profound effect on medical research beginning with the thesis of Eklund and his work on selection bias. Professor Reinhold Bergström moved easily from studies in econometric modelling to survival studies in cancer epidemiology. In the last 10 years there have been 6 Ph.D dissertations done collaboratively between the statistics division and medical researchers and most studies have been published in high quality journals.

6.1.8 Other issues

We notice that the supervision of the graduate students is not consistently well organized.. Furthermore, Ph.D students do not seem to be protected from teaching too much, which is unfortunate because it delays their graduation. Nevertheless, the Statistics division has had a long row of successful graduates.

More predictability with respect to retaining the chairs at department after retirement of the professor is desired. Without predictability long-term planning and the formation of visions are difficult. Finally, it should be mentioned that the panel finds that there is a weakness in the Swedish academic job structure that there are too few assistant professorships in Sweden. The consequence is that too many young Swedish academics are not secured a substantial time doing research while young. This is a particular problem for young females having only stipends as post docs because, because they experience great in-security in case of pregnancy.

6.2 Department of Economics, Faculty of Social Science

6.2.1 Summary

The Economics Department is superbly organized. Its PhD program is among the best in Scandinavia. The research conducted at the department maintains top international standard. It is concentrated around three main areas:

- labour market economics
- public economics
- macroeconomics.

Plans for future research are ambitious but nevertheless realistic, given the solid research record of the department. By implementing their plans the researchers at the Economics Department will most likely make lasting and important contributions at the international research frontier. In order to carry out the research plans requires an increased amount of resources. They are needed, in particular, to finance post-doctor fellows and assistant professors with longer contracts than has been the practice at the Uppsala University.

6.2.2 General assessment

The Economics Department at Uppsala University is superbly organized and functions with the highest efficiency at all levels. Research is organized into a number of groups headed by professors and consisting of other faculty, post doctoral fellows and doctoral students. Each group meets at regular intervals, with presentations by students and faculty. In addition there is a regular departmental seminar. There is an atmosphere of cooperation and collaboration between faculty, between faculty and students and between students among themselves. The morale of the student body is exceptionally high. They find their supervisors helpful and readily available but at the same time independence of thought is encouraged. When doctoral students graduate they have produced three or four papers of publishable quality. Seven to ten students are admitted per year and about eighty percent graduate with doctor's degrees. Research is of an internationally high standard with a high rate of output per faculty member and with articles appearing in journals of excellent quality.

Both faculty and graduate students are composed to a large extent of Swedish speaking males. There are seven full professors of whom two will be retiring within a few years. This engenders apprehension amongst the faculty because there is a possibility of chairs being reallocated to other departments without taking the extremely high output of the Economics Department per professor into account. A reduction in the number of professors would undoubtedly have a negative effect on the quality of the department.

6.2.3 Quality of Research

The assessment of the quality of research in the Economics department is based on the self evaluation report, additional publication listings and discussions during the site visit. According to this report the three most important areas are: labour economics, public economics and macroeconomics.

As a brief summary we find that the quantity of research output in international journals is very large. The journals where research is published are largely just below or include the absolute top journals. Weighed with other evidence we find that the research quality the three aforementioned research areas is somewhere between world leading and internationally high standard research.

Beyond the three main areas mentioned above the research in other areas, such as microeconometrics and environmental economics is also of high quality.

6.2.4 Research environment and infrastructure

The research environment at the Department of Economics is in many ways both active and stimulating. There are at least three weekly workshop series related to the central research areas of the department. In addition, there is a less frequent departmental seminar where economic themes of common interest are taken up and discussed. Seminar presenters come both from Sweden and from abroad. Thesis opponents are requested in addition to give seminars. Furthermore, there are regular seminars at IFAU (Institutet för arbetsmarknadspolitiska utvärderingar), and many speakers in those seminars also give talks in departmental workshops. Close ties with IFAU in general enrich the research environment of the department.

International visitors are mostly short-term ones, with some junior level exceptions. Long-term senior visitors would mean a further positive contribution to the research environment, but attracting them to come to Uppsala is also a financial question. The university may want to think about having financial support available for first-class foreign scholars who want to spend their sabbatical leave or a part of it at Uppsala.

The department offers financial support for junior faculty who presents a paper at a scientific conference. This means increased possibilities for these people to present their work internationally and meet colleagues from other parts of the world.

The availability of high-quality data registers opens up rich possibilities of doing high-quality quantitative research at the department, which has a strong positive effect on the research environment.

Job insecurity in the form of short-term work contracts makes the otherwise excellent research environment less attractive for junior researchers than it could be, and for this reason a number of them have left the department.

The neighbouring IFAU provides to a high degree the infrastructure for empirical research in the Department. The office space available must be deemed adequate. Four first-year graduate students share an office, and from the second year onwards this number equals two.

6.2.5 Networks and collaborations

The department is very well connected to several international networks. Individual researchers collaborate with researchers worldwide. This is reflected in publications and in the fact that two of the professors are currently editors of international journals with a relatively high standing. In this respect the department is doing better than most other departments in Scandinavia. However, it is noticeable that the international element among members of the department is modest, few go abroad for extended periods, and there are few international visitors. About one third of all PhD-students, however, do go abroad for extended periods, although there is no requirement to do so.

6.2.6 Opportunities for renewal and emerging science

All three research programs in the department have an excellent research history with many good publications in leading international journals and with an output of a substantial number of good PhD graduates. Many of these graduates have important jobs in the public and private sector in Sweden. Examples are private banks, the Ministry of Finance, the Central Bank and universities. The programs have thus played an important role in the production of skilled academic labour in Sweden. The leading professors in the programs have also had and presently have editorial positions in top international journals such as *Journal of Public Economics* and *Scandinavian Journal of Economics*. At present the labour market program is a key participant in a Nordic centre of excellence.

In the labour market program future research will focus on education economics, social insurance and analysis of a variety of natural experiments, also randomized. Complex econometric models will be estimated on detailed data sets, which requires the use of advanced micro econometric methods. This work is of interest, not only to the scientific community, but also to policy-makers in Sweden and elsewhere in the world.

In the public economic program the plans for future research are many and varied. Examples include:

- fiscal federalism,
- how taxable income is affected by taxation,
- optimal taxes derived from rather complex econometric models estimated on detailed micro data sets,
- analysis of the monopsony power of institutions in the health sector;
- ageing society and retirement pattern,

- intergenerational transfers.

The work will be embedded in structural economic models and estimated on rich micro data sets. Again, the work in this program is of interest, not only to the scientific community, but also to policymakers in Sweden and elsewhere as well.

The plans for the future in the macroeconomic program will concentrate on the investigation of the microeconomic foundations of new Keynesian macroeconomic models. Theoretical models will be developed and discussed at length. Microeconomic data will be used to find microeconomic evidence for the macroeconomic models. The rich register datasets available at the economics department and IFAU provide very good possibilities for doing this type of empirical work. This research is very important, in particular in these days when much of the macroeconomics around the world, and affecting the thinking of policymakers, is rooted in macroeconomic models that are based on overly simplified representations of microeconomic behaviour.

In order to implement these ambitious plans good researchers and PhD students are needed. In each of the programs there are very active full time professors, and judging from the present situation, the Economics department has been able to recruit very good PhD students. However, to implement the research plans young and graduated researchers who find the working conditions attractive compared to work outside academia. The salary matters, but it may be difficult for a university to match the salary in private banks and the like. Nevertheless, those interested in advanced research may be willing to work for less money (at least for a while), provided that the other conditions are satisfying. Examples of such conditions are long-term job contracts, at least longer than the present ones (which tend to be around 3 years), and a teaching load that makes it possible to do a satisfying amount of research. The best solution is to increase the number of post-docs and assistant professors and finance them through the university budget. A second best solution could be to recruit assistant lecturers (biträdande lektor) who would have a small teaching load during the first four years. In recruiting researchers to the programs at the Economics department it is important to emphasize the research record of the applicant and not let the teaching record dominate the outcome.

6.2.7 Actions for successful development

To maintain the excellent quality of the current program there are a number of problems that need attention. Recruitment is a problem with several aspects. Two of the seven full professors are nearing retirement, and it is important to devise ways to ensure that the positions be saved within the department. Otherwise, quality will be affected in terms of loss of research leadership, graduate student supervision, and program balance. In the area of macroeconomics, current wage structures at the University of Uppsala are not competitive with the outside market even within Sweden. There have been losses of faculty al-

ready and these could accelerate if the wage structure within this area is not addressed.

Another recruitment issue is the length of appointments for postdoctoral fellows - three years. Three years are not enough for a fellow to complete a project, especially if there are commonly occurring challenges, such as the birth of a new child. This last possibility may explain why there are so few women postdoctoral fellows. A three year fellowship is not a safe way to be employed when a woman is of child bearing age.

Besides increasing the length of time for fellowships, the faculty recruiting process needs streamlining. Currently, the cycle may take up to two years and can leave the department at a competitive disadvantage. The length of the recruitment process must thus be shortened.

To increase departmental capacity to conduct research, a critical review of its teaching program and practices should be conducted regularly, beyond the current on-going course evaluations. An enormous amount of PhD teaching time is taken to create and to grade examinations for undergraduate students. Teaching training courses should address this question.

Although there seem to be good opportunities for Uppsala students to study abroad, we recommend that the University create a fund, perhaps with support from private sources, to support foreign visitors, including PhD students, postdoctoral fellows, and visiting faculty.

6.2.8 Other issues

The Economics department has a high quality PhD program which clearly benefits from having many students, who even have an association to deal with organizational matters. The program appears to be very well structured and is clearly among the best programs in Scandinavia. It provides a solid education and has produced many highly successful graduates. The supervision is also well organized and the teaching load among faculty and PhD students is well distributed.

7. Panel 2

7.1 Introductory remarks

This review consists of three major parts, i.e. the assessments of the Department of Business Studies (DBS), the Department of the Social and Economic Geography (SEG) and the Institute of Housing and Urban Research (IBF). For DBS and SEG all members of the panel could participate in the interviews. As IBF is located in Gävle and the visit overlapped with interviews at DBS, the panel had to split up to allow three of its members to go to Gävle. While the panel followed the general programme as proposed by the university, additional and informal meetings were requested and organized with doctoral students of DBS, SEG and IBF. It also has to be mentioned that the expertise of the panel members did not always completely coincide with all the areas and subdisciplines (e.g. in IBF) the panel was asked to evaluate.

7.2 Department of Business Studies

7.2.1 General assessment

The Department of Business Studies consists of five research groups or units, i.e.:

1. International Business (IB)
2. Marketing
3. Entrepreneurship
4. Management and Organization (M&O)
5. Accounting and Finance (A&F)

The IB, Marketing and M&O groups have a relatively long tradition and exist since many years, while A&F and especially Entrepreneurship were established much more recently.

Although DBS is composed of the above mentioned separate sections, it strongly functions as an integrated department. There are many synergies among the five research groups. The building is organized in such a way that the members of a group are deliberately not put next to each other in order to increase the opportunities for interchange across the sub disciplines and intra-departmental collaboration. The doctoral students are considered as full members of the department and are extremely positive about the interdisciplinary exchanges with staff members from other groups. The weekly organized re-

search seminars are highly appreciated by the professorial corps, the postdocs and the Ph.D. students.

At the beginning of 2007 DBS counted 9 full-time professors and 6 chair holders, two of which are up for retirement. There were also 4 part-time professors, 15 senior lecturers, 28 lecturers with Ph.D. and 10 lecturers without Ph.D.

7.2.2 Quality of research

Given their longer tradition the IB, Marketing and M&O groups are considered as well established and internationally recognized research groups with an extensive national and international network. On the basis of the reputation of the chair holders A&F and Entrepreneurship are successfully developing their new unit on the basis of their own contacts and networks. With 44 Ph.D. students and two doctoral research schools which are run from Uppsala DBS plays a major role in the formation of doctoral students. This undoubtedly enhances its research reputation and network.

The engagement and involvement in the scientific community by DBS staff members between 2003 and April 2007 has been quite high, especially in terms of keynote and invited addresses at international conferences, editorships and memberships of scientific journals, research visits of at least three months abroad, visiting scholars of at least three months at DBS, and the number of collaborating institutions with joint publications. All of these activities underline the research reputation of the department. The high output of textbooks and popular publications and presentations, as well as governmental and societal assignments illustrate the interaction with society.

Between 2003 and 2006 the scientific output in terms of articles in journals and chapters in books published by members of the department has gone up systematically from 10 to 78. During this period the annual publication of books was more or less maintained and varied between 4 and 8. The external research funds obtained by DBS increased to kSEK 17,6, while they hovered below kSEK 10 in the previous years.

7.2.3 International Business Group

General assessment

An important and influential research domain of DBS has been International Business (IB). In a sense the study of the so-called internationalization process of the firm (IPF) has put the University of Uppsala on the map in business studies in general and IB in particular. In a rare compliment to this pioneering research, many scholars started to refer to the Uppsala School in IB, meaning the study of the gradual learning process and development in the outward expansion of companies from limited export activities to foreign direct investment via foreign subsidiaries. The fact that many researchers now refer to the

Scandinavian School rather than the Uppsala School might be seen as an indication that the UU has lost perhaps its leading position in its domain and that scholars in Helsinki, Copenhagen and Oslo have caught up with this research approach, even though this partly resulted from their cooperation with UU researchers.

As of April 2007 the IB section counted 14 members. It consisted of 3 full-time professors, 2 senior lecturers, 4 lecturers with Ph.D. and 5 doctoral students. The chair holder and the other members of the group are quite active in organizations such as the Academy of International Business and the European International Business Academy and participate in many other international meetings and networks.

Quality rating

The IB unit at the DBS has not limited its research to the IPF issue and has carried out deeper analyses of the management of multinational enterprises (MNE) especially using the network approach, which also been promoted by the Marketing group. New themes have been tackled such as the growth of the MNE, the transfer of technology and know how and the subsidiaryheadquarter perspective. The research of the IB section became more topical based and often consisted of applications of the IPS approach to new issues in a more fine-grained way. Business activities are extremely dynamic and the IB unit has succeeded in keeping up with new developments. Also more attention has been devoted to non-business actors in the study of the networks.

Very positive is that during the last few years 11 papers were published in internationally refereed IB journals, 4 of which appeared in the top ranked IB journal JIBS (Journal of International Business Studies) and 3 in the second rated Management International Review (MIR). The above mentioned synergies between the research groups are illustrated by the fact that certain JIBS articles emanated from another research unit than IB (e.g. Entrepreneurship). Using 10 years of publications data (1995-2004) from the four leading IB journals in which schools were ranked UU took up the sixth position (by number of appearances) in a list of 50 institutions that were active in this discipline. By weighted number of articles the UU was classified as tenth. According to both measures the rank of UU went up in the second part of the ten year period during which the analysis was carried out.

Research environment and infrastructure

Although the IB section has been quite successful in finding the necessary funding for their research initiatives, it might still be useful to participate more in competitive funding, such as from the EU and other international sources, as this is also a way to consolidate and improve one's European and worldwide competitive position.

An interesting dimension of the research infrastructure is the Nordic IB Research School (the UU together with three other Scandinavian institutes)

for doctoral students which is in its fourth year. Although this initiative was intended to establish a critical mass of Ph.D. students for a number of specialised courses, it has also allowed the UU to consolidate its position as one of the hubs for international business studies in Scandinavia and certain participating European countries. Yet, it is to be regretted that the IB Research School can not be broadened into a full fledged European initiative because the initiators fear that it would develop into a bureaucratic organization and lose its effectiveness.

Networks and collaborations

Given the need to extend the research work, further attempts should be made to make the staff even more international via its hiring policy, the attraction of doctoral students from abroad and the invitation of reputed foreign scholars for longer periods than is the case today. To link up with well known research centres abroad is also essential and the contacts with Leeds University in the UK and Temple University in the US are important steps in guaranteeing continued high quality research and uncovering ideas for renewal.

Opportunities for renewal and emerging science

The IB researchers have been very successful in collecting data on Swedish companies which allowed them to carry out empirical studies to test their theoretical writings. These efforts to establish databases should be continued and be extended to other (especially emerging) economies as it would give more exposure to the department and the unit in those parts of the world where IB education is growing together with the expansion of those economies. That does not mean that the competitive advantage in certain research areas should be abandoned, however.

Actions for successful development

There is a need for renewal by concentrating, even more than is being done today on the dynamic aspects of the changing MNE, the policy dimensions and the social role of the embedded MNE. Multinationals are being increasingly confronted with new demands such as alleviating poverty, slowing down climatic change, improving human rights, corporate social responsibility, etc. The implications of those developments for the firms and the host governments are becoming much more relevant than they used to be. Synergies within DBS are certainly possible as other research groups have also shown an interest in some of those issues. In terms of theory development the boundaries of the firm merit continued attention. While theoretical stability seems to have been achieved, the work of the IB unit should continue to be challenged.

7.2.4 Marketing Group

General assessment

Uppsala was the birthplace of the Industrial Marketing and Purchasing (IMP) group, which became famous for its recognition that in business to business markets buyers and sellers, more often than not, formed relationships rather than operated at arms' length. This led to the Interaction and Networks approach to buyer - seller relationships and the creation, eventually, of a world-wide community of researchers which is generally regarded as the leading industrial marketing paradigm. The originators of this movement have, for the most part, moved on or retired though some retain links with Uppsala.

The current research group is carrying on and extending and diversifying the tradition most obviously in terms of the study of network dynamics (as opposed to statics), non-business network actors and extending its scope to include consumers as well as organisational actors. However the most radical reinterpretation has occurred in relationship to its application to Science and Technology studies where it is being used to link science through technology to markets and adoption and usage. In all of these cases the approach is primarily multidisciplinary and diverse yet remains wedded to the underlying network approach. There are synergies between and among the various research strands and with other parts of the department notably Management and Organisation.

Quality rating

The traditional IMP research subgroup's publications quoted in the documents provided by the group would suggest a research rating of "internationally recognised". It should be noted, for example, that the past publications provided included "peripheral" members of the department. Publications of the STS linked researcher are as yet too few so that to make a judgment about possible quality would be premature.

Research environment and infrastructure

The composition of the marketing group is relatively good with a mixture of senior and junior staff as well as a large number of Ph.D. candidates. However the continued involvement of the emeritus and visiting professors cannot necessarily be relied upon and therefore constitutes a risk factor. There is also a possibility perhaps that the STS link may prove less strong in the long term. Collaboration within the IMP groups and between those groups appears to be strong as is common across the whole department. There are a large number of visitors and most researchers appear to make regular international visits. The physical facilities are excellent especially for doctoral students.

Networks and collaborations

The IMP group comprises around 200 researchers worldwide and there are multiple group and individual relations and configurations. In addition there is a database of IMP papers and resources on a dedicated website in BI, Oslo as well as a listing of their locations. It is never a problem to find a useful contact or possible collaborator. The availability of resources to develop such collaborations may however be a problem.

Opportunities for renewal and emerging science

There are two kinds of opportunity evident in the group. The first is renewal via the route of following a somewhat incremental path, a strategy which is currently being adopted by the majority of the IMP researchers. The STS research centre represents the emerging science option and while there is no guarantee, it is likely that the combination of two relatively mature social science traditions, IMP and STS, will produce results of great interest and utility.

Actions for successful development

There is every reason to support both of these research options and even more to consider ways in which the relationship between the two can be made closer and therefore provide synergistic benefits. Publishing in top international journals should be encouraged.

7.2.5 Entrepreneurship Group

General assessment

The Entrepreneurship group is new having been established in 2005 with the appointment of a single professor as the result of a donation by Anders Wall a well-known entrepreneur. He has been joined by 3 doctoral students, all female, who are carrying out research, which has synergies with the International Business and Social and Economic Geography and is interdisciplinary in nature. It should be noted that there is a strong demand for teaching in this discipline, particularly the more practical aspects, which is a factor to take into consideration when assessing the group.

Quality rating

The chair holder has a good research and publication record with recent papers in the *Journal of Business Studies* and the *Journal of Management Studies*. While it is too soon to judge the quality of research that the group might produce the portents look quite favourable. There is, however, a risk that diseconomies of scale may prove problematic. Nevertheless relationships to other groups within the department should provide enough support, particularly to the doctoral students, to enable research progress to be made.

Research environment and infrastructure

The chair holder of the entrepreneurship group appears to be very competent with strong and clear views of how the group should develop. As mentioned before there are close contacts with the IB and other groups within the Business Studies Department.

Networks and collaborations

The group has good mechanisms for internal cooperation but it is too early to say what external collaboration and links might result in the longer term.

Opportunities for renewal and emerging science

The creation of this group is an example of both renewal and emerging research activity and, given the right conditions, should be the site of new insights into activities that are important in terms of both Mode 1 and Mode 2 university goals. More specifically the pursuit of a subjectivist approach to entrepreneurship is regarded as a novel approach to the research domain.

Actions for successful development

During the interviews with members of the department of Social and Economic Geography, it became apparent that there is also a research interest in entrepreneurship, more particularly in ethnic entrepreneurship. Even though the background of this latter research might be different cooperation could be useful for both small groups.

7.2.6 Management and Organization Group

General assessment

The Management and Organization (M&O) grouping has emerged out of a long tradition of research at Uppsala that can be traced back to the pioneering work of Sune Carlson and the internationally important studies of Lars Engwall. The core of M&O currently comprises two full time chair holders, one of whom is seconded within the university (20%) and the other is nearing retirement, one part-time professor, one senior lecturer (docent), seven lecturers (with Ph.D.), one lecturer (without Ph.D.) and three Ph.D. students.

Quality rating

The tradition of research in M&O has been that of the 'lone scholar'. Under the leadership of the second chair holder (20%), there is a strategic move to develop into a school of researchers that is focused around two large and one smaller research projects (Global Enterprises, Mediators and Society; Management and Governance of Health; Changing Governance in Universities), that are funded by the most prestigious research councils that have a common theme of transnational governance. This work is exceptionally multidis-

ciplinary as it works with political science, sociology, law and education; it is also multimethodological and involves international collaboration.

The panel's assessment is that the quality of the research undertaken by M&O is likely to depend heavily upon the success in retaining and developing the strength of the research group. The problem is compounded by the large gap between highly capable but junior researchers and professors who are nearing retirement or seconded within the university. A number of measures (in no order of priority) might be considered to improve the prospects of producing a large quantity of very high quality research (see further).

Research environment and infrastructure

The M&O group is in charge of the Doctoral Research School in Management and IT (MIT) as the chairman, dean and vice-dean belong to the UU. It was established in 2001 by the Swedish government to organize doctoral programmes in this domain for Swedish Ph.D. students from 11 collaborating institutions of higher learning. Five to ten graduate courses are held annually and are followed by about 60 students.

Networks and collaboration

The development of networks and collaborations has been facilitated by a number of factors that include: the international standing of the work done in this field by M&O members; the distinctive reputation of the M&O leader in institutional theory which has become a dominant strand in organization theory; the longstanding connection with Stanford University through Scancor which has been particularly significant in attracting a stream of international scholars to the department and in enabling young scholars to visit at Stanford and elsewhere in the global institutional theory network. The importance of the Uppsala group in this network is demonstrated by the seconded chair holder's co-editorship of the first Handbook of Institutional Theory (in press) which will undoubtedly become the key reference volume in this field.

Opportunities for renewal and emerging science

There is evidence of high quality in this grouping, which comprises a number of high calibre, ambitious younger researchers who are eager to publish in international journals and showing the capability of doing so. They are benefiting from a strong tradition of research in the M&O area, albeit of the lone scholar variety, and they are using a number of institutional and selfhelp mechanisms to realize their ambitions. The challenge for the M&O group and the Business Studies department more generally is to develop and retain this generation of active researchers working in the above projects. It is not clear that there is a plan for this purpose beyond the important hiring of a part-time professor to help fill the 'gap at the top'.

The risk is that a group which has the promise of making a significant impact upon the field will struggle to make this a reality as a consequence of (1)

limited guidance from experienced researchers, (2) lack of job security and attractive offers from abroad, or (3) leaving for nonacademic careers. Given the success that these early career researchers may have in publishing in the top international journals, the chances of looking for a position elsewhere might even increase.

Actions for successful development

The panel's assessment is that the quality of the research undertaken by M&O is likely to depend heavily upon the success in retaining and developing the strength of the research group. The problem is compounded by the large gap between highly capable but junior researchers and professors who are nearing retirement or seconded within the university. A number of measures (in no order of priority) might be considered to improve the prospects of producing a large quantity of very high quality research:

1. Attract prestigious visitors to the group who are eager to work with a group of ambitious researchers over a long period (a long visit or a series of visits over an extended period).
2. Apply for major, longer term grants that would provide continuity of employment beyond the life of the existing grants and establish the group as a globally recognised Centre for Transnational Governance (or some such).
3. Introduce a tenure-track process for the most research-active lecturers.
4. Give encouragement (and honorarium) to most research-experienced lecturers to mentor and coach colleagues who are at an earlier stage of their careers.

These measures might also be relevant for some of the other research groups at DBS.

7.2.7 Accounting and Finance Group

General assessment

The Accounting and Finance (A&F) grouping is in an early stage of development that has potential to grow into a credible research group. In the past, research undertaken by A&F has been most closely aligned with research undertaken by the larger international business (IB) grouping. A minority of A&F members has participated in the European MERITUM research programme which is concerned with the construction of Intellectual Capital. Currently, A&F has a small core of active researchers with a larger number of staff who are teachers serving a strong undergraduate demand for accounting and finance teaching. A&F staff comprise: one professor, one senior lecturer ('do-center'), eight lecturers (with PhD), six lecturers (without PhD) and eleven PhD candidates. There are firm plans to recruit up to 6 new researchoriented staff into this group (see below).

Quality rating

The academic competence of A&F is limited primarily to the area of management accounting which fits well with the non-mathematical orientation of most other staff in the department of business studies. The chair of the group, appointed five years ago, has an established research reputation and good connections nationally and to other Nordic researchers. The chair of A&F has published in the leading journal in the field, *Accounting, Organizations and Society* and is currently involved in the research programme MUSIC that examines accounting and Intellectual Capital and this project necessitates the recruitment and supervision of a number of Ph.D. students.

Research environment and infrastructure

The panel's impression is that the chair holder has the confidence of the other core researchers, who are now moving into new research areas (e.g. integrative management control), attracting research funding and are beginning to publish in respectable journals (e.g. *Accounting, Auditing and Accountability Journal*), and has the intellectual and social capital relevant for building a research-active group, though this process will be demanding and carries risks.

Networks and collaborations

The proposal to launch a Stockholm-Uppsala School of Accountancy in 2008 has great merit and might be a source of Ph.D. applications. It also has the advantage of allowing a more fruitful interface between accounting and law. However, it is not sure if the UU could play the same kind of role as is the case in the NordicIB and M&O (MIT) doctoral networks.

Opportunities for renewal and emerging science

The pressing challenge for A&F is to shift from a teaching-centric grouping to one that is more research-focused. Recruitment of active researchers, and/or recruits with strong research potential, will be critical. This will not be easy as accounting is a notoriously difficult area in which to recruit and retain research-oriented staff. The prospect of success in this ambition may to be improved if recruits can be coached and mentored by researchers with cognate interests in other groupings within the department. There is a better chance of this outcome if the focus of new members of A&F is upon issues of the practical conditions and consequences of accounting in processes of governance and control as this connects well with the research focus of members of the Management and Organization grouping. Otherwise, an insupportable burden of development will fall upon the Chair; and this risks holding back the research activity of the person who, in the short term, is best placed to raise the international profile of the grouping and to develop national and international linkages and collaborations.

Actions for successful development

The immediate task for A&F is to appoint and then support a number of new staff, as well as doctoral students, who have strong research capability. Unless A&F is fortunate in recruiting six new staff who are established researchers, it may be advisable to phase recruitment over a period. If possible, it would be desirable to recruit at least one highly experienced and well published person at docent level who can work with the Chair to develop research capability within A&F (doctoral students as well as new appointments) and make successful applications for research funding.

7.2.8 Final quality assessment

International Business: Internationally high standard

Marketing: Internationally high standard

Entrepreneurship: Not rated (too recent), even though promising prospects

Management and Organization: Internationally high standard

Accounting and Finance: Acceptable standard

7.3 Department of Social and Economic Geography

7.3.1 General assessment

The research within the Department can be divided into two large study fields, and one more loosely connected group, consisting of three sub-units:

1. Economic Geography, institutionalised within the Centre for Research on Innovation and Industrial Dynamics (CIND), mainly funded through external domestic sources - e.g. VINNOVA and Bank of Sweden Tercentenary Foundation;
2. Population and Social Geography, Urban and Rural studies, closely connected with the Institute of Housing and Urban Research (IBF) at Gävle; The IBF is also an independent unit within the Social Science Faculty at Uppsala;
3. Landscape, Environment and Societal Transformation:
 - a. Transformation socio-spatial processes in the East and Central European landscape;
 - b. Development studies;
 - c. Applied environmental impact assessment.

The direct links between these groups are limited, although there is a strong identity of belonging to the discipline of social and economic geography across the research group lines. There is, though, a common higher level seminar, bringing together all Ph.D.students, chair holders and senior faculty. There are, furthermore, common premises for all staff in order to forge

good communication and interaction, despite obviously different research agendas. All chair holders and promoted professors are male in the age range 50+. All are Swedish and have, with one exception, been recruited solely from Uppsala. Only one of the senior faculty staff (associate professor) has received a Ph.D. from another country.

Compared to other Swedish universities, the Uppsala department is heavily concentrated on research and Ph.D.education, and is, thus, relatively smaller in undergraduate studies. Despite the location within the Centre of Economic and Business studies, there is limited participation in the undergraduate programmes, but the department has to rely on the recruitment of bachelor and master students from independent courses.

7.3.2 Quality of research

Economic Geography

There is a certain specialization and division of labour between the economic geography research groups among the Swedish universities, resulting in the fact that the Uppsala institution is limited mostly to innovation, spatial clusters and industrial dynamics in general.

The CIND group has grown rapidly during the past ten years, due to the concentrated effort to studies of clusters, agglomerations, local innovations and industrial dynamics, mainly based on Swedish empirical examples, but in close cooperation with leading research groups in Europe and North America. It has a clear and determined focus, and has gained an excellent international reputation, being a vigorous and dynamic research group within its specialization. It is at the same time closely linked to policy-oriented studies, commissioned by local and central authorities in Sweden. Apart from the holder of the chair in economic geography, who is at the same time director of CIND, there is one associate professor, four post-doc researchers, one visiting professor, and nine Ph.D. candidates.

The Centre has a multidisciplinary orientation, also being staffed by researchers and students from the Departments of Business Studies and Economic History respectively, but dominated by Economic Geography.

Since the formal establishment of the Centre a few years ago, there has been a continuous growth of quantity and quality when it comes to active participation in international conferences, as well as publications in peer-review journals of good, sometimes top-end, quality. Several of these articles are written by the chair holder, usually co-authored with 1-2 internationally well-known researchers. The publication strategy seems to have been to emphasize teamwork rather than to make individual contributions. Yet, some younger faculty members and doctoral students succeeded in publishing in internationally peer reviewed journals.

The overall progression of quality has been very good, and continues to rise. The published articles by the chair holder and his main co-author are in

a number of cases widely cited and meet a world-class standard. The cooperation with well-recognized researchers and research groups in the rest of Europe, as well as in North America, is extensive and growing. Ph.D. students and post-doc researchers are involved in international exchange. The challenge for the group is now to use their empirical studies in order to improve existing theories of the spatiality of innovation and industrial transformation, and to extend the hitherto little developed opportunity to combine the different research traditions in economic geography, economic history and business studies into a new theoretical framework.

Population and Social Geography

Population and social geography within the Uppsala department covers a broad area of topics: urbanization/counter-urbanization, rural and urban planning, residential segregation and settlement policies. A unique data base, consisting of longitudinal data covering the whole Swedish population (GEOSWEDE), has allowed this research group to investigate neighbourhood effects, i.e. relationships between spatial context (“place”) and individual life chances. The group has successfully put out a number of articles in recognized international journals. The group has moved to the frontier of such research, and its members collaborate with researchers in several countries. Their main challenge now is to identify and explore various explanations for neighbourhood effects, relating to social and institutional factors. Given their current position, and the established collaborations, the group should have good opportunities to improve our understanding of “place poverty”. Using the same data, the group has also successfully explored intra-urban mobility. Current research in this field covers dynamic aspects of ethnic segregation and institutional discrimination in the housing market. There is also successful research on housing careers, housing preferences and operations of the housing market.

Transformational processes in East and Central Europe

This research derives its origin from central topics in human geography, e.g. historically oriented studies of the transformation of the agrarian landscape, while at the same time incorporating new methods and concepts. The specific focus has been on areas within the former USSR, with a concentration to Estonia. The group is led by a senior chair holder with a solid reputation, supported by three junior researchers and two Ph.D. candidates. One of the post-doc researchers has managed to publish his results in peer-reviewed journals within the field. Otherwise, it seems that the international impact of the group is limited, despite a well developed cooperation network in East and Central Europe. A previous representative of this research tradition has later gained a fair international reputation and received a professorial chair at another academic institution in Sweden.

Environmental impact assessments; development studies

The chair holder has recently moved from the Faculty of Science, being originally trained in physical geography, and represents the tradition to link environmental change with the impact of the human factor. Originally the programme was directly funded within the Swedish Official Development assistance scheme (SIDA/Sarec). Three Ph.D. dissertations have been published under his supervision, and there has been a strong demand by government authorities and public institutions to take advantage of the competence to understand environmental risks and hazards. Field studies have been made in Southern and Eastern Africa.

There are also some links with the only senior researcher who is engaged in development geography, in this case Sri Lanka, with a built-up local research network, partly financed within the ODA framework. These groups are, though, too limited in size to have a chance to gain an international recognition but they meet an acceptable standard. It is recommended that they should more systematically link up with researchers in other faculties and centres interested in developing countries.

7.3.3 Research environment and infrastructure

CIND is a good example of an excellently developed research infrastructure. There is solid financial support extend over a longer period. This support has mainly been used to build up a strong group of Ph.D. students, and will before the end of the year result in eight dissertations in total.

The research within population and social geography emerges from the cooperation between IBF and the Department of Social and Economic Geography. Key members of the group have a position at both institutions. The group has good administrative and financial support at IBF. One weakness, though, is a lack of GIS competence and support. The other research groups have to rely on external funding for support of single projects, and have, accordingly, problems to reach the critical mass of researchers at a long-term basis.

7.3.4 Network and collaborations

The CIND group has built up an excellent network, comprising research groups in e.g. U.K., the Netherlands, Germany, Canada and the U.S. There is also a close collaboration with Copenhagen Business School. Members participate actively in international conferences, e.g. the AAG annual meeting, as well as in the IGU Commission of the Dynamics of Industrial Space.

The population and social geography group does also have extensive collaboration with similar research both in other European countries and in the US. The research conducted by this group plays an important part within the European Network for Housing Research.

The remaining research groups possess good international contacts within their respective fields of study. The cooperation with universities in the Baltic states, Africa and South Asia has been developed over a long period. However, most of these contacts are for practical research purposes and not with scholars having a major international role in geography.

7.3.5 Opportunities for renewal and emerging science

The Department has in recent years, through a conscious and active strategic policy and advantageous funding situation, been able to attract a larger number of qualified Ph.D. students in competition within other corresponding institutes of human and economic geography in Sweden. The annual production of Ph.D. degrees is, accordingly, by far the highest. In total around 35 dissertations have been defended since 2000. On the other hand there is a shortage of staff in semi-senior positions. This observation is particularly valid regarding economic geography. Post-doc positions will in some cases provide an opportunity for 2-4 years of research after dissertation, but an even larger problem will be the challenge to offer promising young researchers a long-term career opportunity with a visible tenure track system. The praxis to distinguish between chair holders with a fair opportunity to conduct research, and promoted professors with limited research opportunities, might also be a constraint when it comes to attract post-doc researchers who are close to the “docent” level.

There is obviously a clear contradiction between the present aim of offering a wide range of research fields, and at the same time a focus on a few themes, in which it is possible to reach international recognition. The panel recommends that the opportunities to formalize the division of labour between the different departments and research groups, connected to human and economic geography that exist within the region, should be explored in depth.

Regardless of specialization, it is important for the sake of the identity of the Department and for its long-term renewal, that it is encouraged to cover broader emerging geographical themes that are not in the current mainstream of the debate.

7.3.6 Actions for successful development

The Department has been very successful in transforming itself into a very productive and research-oriented unit over the last ten-fifteen years. The leadership should be congratulated in having managed this change. The future challenge will therefore be how to keep to the present pace, and to decide upon a strategy for e.g. how to finance CIND after the present funding period has expired. The generational shift is also a matter of concern, since three out of four chair holders and one promoted professor are expected to retire within

ten years. Mentoring and developing successors and an active succession planning in general should be given high priority.

7.3.7 Final quality assessment

Economic geography: Internationally high standard

Population and social geography: Internationally high standard

Transformational processes in East and Central Europe: Acceptable standard

Applied environmental impact assessment; development studies: Acceptable standard

7.4 Institute for Housing and Urban Research (IBF)

7.4.1 General assessment

The Institute for Housing and Urban Research is a multidisciplinary research institute established in 1994 under the Faculty of Social Science and located in Gävle. The main research themes are housing economics and policies, urban life and city planning, ethnic and gender relations and sustainability. The researchers come from various disciplines including economics, human geography, political science and sociology. There are 17 researchers, 12 PhD students and five administrators. Professors and senior lectures teach at the departments to which they are affiliated (Economics, Economic History, Government, Sociology, Psychology and Geography). 20 per cent of their time is supposed to be spent in Uppsala and 80 per cent in Gävle for research and supervision of PhD students. This gives lectures and assistant professors good opportunities to qualify themselves as full professor. The permanent professor positions at the University of Uppsala give the institute continuity. Also, the researchers do not need to spread their time and resources to engage in short term research projects. This makes also possible doing basic research and accumulate knowledge. Two of the disciplinary groups also play important roles in the research activities of their respective departments in Uppsala, even though the geographical distance between Gävle and Uppsala is quite high.

The institute publishes one scientific journal and sponsors another. The institute also hosts the secretariat of the European Network for Housing Research (ENHR) which Professor Bengt Turner at IBF established in the late 1980s.

The researchers express great satisfaction with the administration.

7.4.2 Quality of research

Although IBF is a multidisciplinary environment, researchers working there also contribute to and participate in the debate of their own disciplines.

The group of human geographers

The group of human geographers is focusing on topics like neighbourhood effects, ethnic/class/gender relations, but also urban life, city planning and sustainability. There has been and still is an important research interest in housing preferences and housing careers, tight housing markets and regional housing markets. The GEOSWEDE database used in this research (Cfr SEG) was initiated by the IBF geography group. It is partly funded by IBF and forms a strategic asset of the Institute.

Geographers working at IBF publish in leading international refereed journals and are active in international research networks. They appreciate the possibility of participating in multidiscipline networks, such as the European Network for Housing Research.

Research on neighbourhood effects has been also been a main activity during the last few years (Cf. Department of Social and Economic Geography).

The group of political scientists

The political scientists have published within fields such as national housing policies, welfare state reforms, local government, ethnic organizations and urban politics. Some researchers are working with established theory, such as contextualized rational action, while others rely more on new theories related to network governance. Likewise, the group applies a combination of traditional and less traditional methods. They communicate both with colleagues in political science as well as in multidisciplinary fields as housing and urban questions. They followed the tradition of mainly presenting their research results in Swedish, but are now aiming to publish more in international refereed journals.

The group of sociologists

The sociologists cover areas such as urban life, politics of place, ecological sustainability and housing opportunities for different demographic groups. The sociologists have a tradition of publishing monographs, but they have also published in recognised international refereed journals. Their research on urban life and place politics draws successfully on a combination of sociological theory and insights from neighbouring disciplines.

The group of economists

The economists at IBF have played a significant role in international housing research. Bengt Turner, in particular, was extremely active in networking and managed to publish about a wide range of topics. As a result of the death of the leading figure and the prospects of the retirement of another professor,

the continuity of economic research is being threatened. New staff members need to be recruited urgently. Current research relates to topics such as price adjustments in the housing market, housing wealth and consumption, housing problems in metropolitan areas and housing affordability in China. This latter research is carried out by some young and promising housing experts.

Next to the above mentioned disciplines, IBF has competence in areas such as psychology, anthropology, ecology and economic history. Psychology for example, has been successfully used in the research on housing and health. Also psychology has come into play in the emerging focus at IBF on sustainable urban development. In both cases such research has resulted in numerous articles in international journals over the last few years.

Contribution to the university departments

The group of geographers in particular, but also the other groups contribute in an important way to the research at their respective departments at the University. While some groups (e.g. the economists and the political scientists) in Gävle are small compared to the departments in Uppsala they contribute to the discipline departments in Uppsala not only by their teaching (including Ph.D.courses), but also their participation in research projects, their supervision of doctoral theses, the organization of research seminars, conferences and other activities.

7.4.3 Research environment and infrastructure

IBF offers a multidisciplinary environment for joint projects for researchers from different disciplines as well as an opportunity to get comments and fruitful criticism on projects in one discipline from the point of view of other disciplines. The multidisciplinary environment helps researchers to broaden their approach, gain a deeper understanding on the topic and test the concepts used in their discipline. The multidisciplinary environment might even be intensified and be used even more to consolidate political approaches. The weekly multidisciplinary research seminars offer excellent opportunities for dialogue among disciplines. Especially the doctoral students expressed their satisfaction with the comments they usually received also from the researchers and fellow students from other disciplines.

The researchers at IBF are actively involved in public debates and in this way fulfil the so-called third mission of the universities. An example of such an activity is a housing week IBF organizes annually where research results are presented and discussed with people who do not belong to academia.

7.4.4 Networks and collaborations

By being in charge of and hosting the secretariat of the European Networks of Housing Research, IBF has a central place within housing research not

only in Europe but over the whole world by supporting the establishment of similar networks, The Asian Pacific Network is the most successful example. Today one of the researchers from IBF is engaged in the building up of a Latin American Network of Housing Research. The hosting of the secretariat has usually produced a small deficit. This deficit ought to be seen as a useful investment and should not serve as a negative argument if the ENHR asks the institute to run the secretariat in the next years.

Every second year IBF has arranged a multidisciplinary seminar for housing and urban researchers in the other Nordic countries. IBF should continue this valuable network building activity.

7.4.5 Opportunities for renewal and emerging science

There is now a promising cooperation between some of the sociologists and the political scientists in research on urban places. Elements from constructivism and rationalism have been combined in order to explain the governance of public place and the resistance to closures. The plans for further research on new sociology of housing and sustainable urban development seem promising fields to develop.

7.4.6 Actions for successful development

IBF has earlier been a central actor in applying for a centre of excellence; Uppsala Centre for Research on Social Integration and Segregation. This application obtained a high rating, and ideas and elements of this multidisciplinary research program should be central in the next years.

7.4.7 Final quality assessment

Because of much successful cooperation across the frontiers of disciplines, it is rather difficult to assess the different disciplinary groups separately. Therefore the institute as a whole is regarded by the panel as having an *internationally high standard*.

8. Panel 3

8.1 Units for evaluation

- *At Faculty of Social Sciences*
 - Department of Sociology
 - Division Media & Communication, Dept. of Information Sciences
 - Division Food & Nutrition, Dept. of Domestic Studies
 - Department of Education
- *At Faculty of Educational Sciences*
 - Department of Curriculum Studies
 - Department for Studies in Education, Culture & Media

8.2 General remarks

Panel 3 has evaluated the research activity in six departments/units. Based on our observations and before giving the assessment of each department, the panel members wish to emphasize some general themes the university should address to enhance quality.

- The set-up of KoF does not allow a well-founded judgment on the substantive quality of the research. Our remarks are based self presentations, the indicators (often unsystematic) provided by the background materials, but also on our previous knowledge of the work done and further documentations during the site visits.
- The UU does not appear to have a culture of keeping track of its resources and their uses, nor of the outputs. This is an obstacle to effective planning and strategic change.
- As part of the Quality and Renewal process a bibliometric study is undertaken by external expertise. A bibliometric analysis is a productive tool to measure research outcomes, channels of scientific publication, impact, research collaboration etc. However neither existing international nor national databases opens for sound bibliometric studies of scientific productivity and quality in non-English speaking countries, nor in non-English scientific publications. The existing databases do not account for different traditions of scientific publications. This is especially the case in areas of humanities and social sciences. Thus even though bibliometrics is a promising tool, it is not a valid in-

strument to measure quality of research in these areas. As part of developing an administrative system to monitor research output at the university and as an instrument to promote research quality, all publications should be indexed for bibliometrics studies. Such an initiative is for example taken by the Norwegian Association for Higher Education Institutions.

- Budget rules allow, and according to our informants, makes necessary to separate teaching and research. For an active research-based university this is Budget rules allow, and according to our informants, makes necessary to separate teaching and research. For an active research-based university this is a serious obstacle and the university leadership should eliminate such separation wherever possible. To strengthen academic leadership and to create more dynamic autonomous units at the university, the different units should get a lump sum funding according to well defined criteria. The allocation of resources to different activities should be delegated to the basic units.
- Undergraduate programs and teacher training programs at the UU can hardly be recognised as research-based. UU should consider introducing and funding senior lecture positions with a substantial time for conducting research.
- Few in permanent positions at the UU have research as part of their obligation (or right). Hence, research activity at UU of Uppsala is vulnerable depending on few chair positions. Introducing senior lecture positions with research as part of the requirement will contribute to continuity in research and to the recruitment of active, up-dated researchers.
- The organising of the research in research groups promotes collaborative research efforts and interdisciplinary research. To avoid introducing a fourth administrative level at the university, UU should consider abolishing departments as an organising unit for research. Educational programmes could be organised at the faculty level.
- UU should consider introducing an incentive structure recognizing and awarding attainment of external funding of research. A system of matching funding should also be considered (this is often a requirement by external funding agencies).
- In a small country it is important to find a balance between broad research and centres of excellence. Broad research activities are a prerequisite for research based basic education and communication with and import of international research.

These general remarks are more or less valid for the differing units, all of them sharing some of these problematic conditions, and some even worse than covered by “general remarks”.

8.3 Department of Sociology

8.3.1 General remarks

See initial “general remarks”, clearly valid in all respects for this unit.

8.3.2 General assessment of the department

The research profile is diverse, including (a) gerontology; (b) immigration research (c) ; child and youth research, especially violence in the family; (d) disability studies; (e) sociology of consumption; and (f) social theory. Furthermore, (g) the department participates in the Institute of Housing and Urban Studies (Gävle). Partly these areas involve policy development and evaluation, especially (c). In general, the practical orientation of research activities indicate a very high degree of outreach (Omvärldsorientering). The department is very strongly committed to knowledge production in the context of application (especially a-d, and g), and partly very sensitive to gender issues.

8.3.3 Quality of research

The gerontological research has an international reputation. The current situation might serve as a basis for continued success, but would require active strategic decisions to make further advances. Childhood and youth research as well as disability studies are “golden nuggets” but likewise require a firm strategic support to develop into internationally high standard endeavours. The Institute of Housing and Urban Studies makes a valuable contribution to the department’s teaching and research. The relationship to policy development and evaluation should be carefully balanced with high academic standards. The department’s work in immigration research needs to be strengthened in volume and in its disciplinary connections. Professor Gronow’s role as a leading European sociologist of consumption and a social theorist was hardly recognized at all, instead of serving the department in strengthening its disciplinary identity. In the context of the faculty of social sciences of the prestigious UU, sociology should have social theory and the history of social thought as well as research methods among its priorities.

8.3.4 Research environment and infrastructure

Personnel composition is the most serious obstacle to research development in this department as in several others that we assessed. Only 3 professors with chairs have 50% research positions, others (15 FTE permanent academic staff) are formally allowed to allocate 20% and in practice as little as 10% to research. This is not sufficient even for efficient acquisition of external funding. The number of pre-doctoral researchers has gone down from 23 to 9 in 2001-2006. The rule requiring full-time funding for 4 years for doctoral researchers

is prohibitive, given the unavailability of internal resources. Stipends from foundations would be indispensable to give some young researchers independent individual research positions, but are usually not available for the full 4 years. Flexibility in this matter is a survival question for this department.

Local collaboration between the department's researchers is minimal, visiting scientists are not used as a resource for lack of time (and other resources). Low intellectual synergy is a problem, research teams working mostly on their own. The centrality of **the body** is said to be common ground for a theoretical punch but so far this prospect has been unexploited, although the panel can imagine this as a promising idea. Departmental seminar activity for young researchers is a vital mechanism to improve scientific quality, integration, level of ambition and exchange.

The key obstacle for developing a viable research environment is the separation of teaching and research. Structural mechanisms to this effect should be eliminated at the faculty, university and system level. Within the limits of available possibilities the department should rethink its teaching structures and curriculum, eliminate redundancies, invest in renewing personnel composition, back up ambitious high quality research initiatives and ensure reasonable career prospects to young and mid-career academics.

The Bologna process is not yet completed in the department. Given the currently inadmissible amount of resources devoted to undergraduate teaching, all levels (department, faculty, UU, system) should take strategic action to avoid its deleterious effects on research possibilities. Introducing a new social work teaching programme in this department may drown the staff terminally in a new teaching load unless measures are taken to ensure that a corresponding research input comes with it. Teaching social work in a university context should be research-based.

The department needs a substantially stronger leadership structure for strategic decision-making and implementation. To assure this cannot be the sole responsibility of the current staff but needs the support of the faculty and above all the university administration.

There is an apparent problem with internal financing, which is insufficient to maintain or develop a viable research infrastructure but probably very disturbing in terms of internal competition for minor resources with symbolic loadings out of proportions.

8.3.5 Networks and collaborations

The actual degree and quality of international and national collaborations and networks is far higher than indicated by the background materials¹. Nevertheless, the importance of exchanging students, teachers and researchers with

¹The department arranged and hosted 1978 the World Congress in Sociology for International Sociological Association, an every 4th year occasion, still kept in the memory of the international community as Uppsala as one of the global nodes of Sociology.

other universities should be stressed. The panel had the impression that relatively few references were made to the work of colleagues among the staff. The silence might indicate a dysfunctional timidity in intra-departmental relations and a deficiency in the team's social capital.

8.3.6 Opportunities for renewal and emerging science

The notions of body and care put forward in the background report are under-theorised and not actually shared by the research streams within the department. The existing theoretical resources of the staff should be prompted to turn these notions into golden nuggets to inspire and integrate future research innovations. The policy context should be taken advantage of but it should not dominate academic endeavours to suppression. The staff's view that generational renewal is a key issue is more than justified, but again, the department alone has limited capacity to promote it without institutional support.

8.3.7 Actions for successful development

The informants and the background material indicated no proactive approaches to research quality improvement. In our view, the best would be to strengthen leadership (time, mandate, etc.) in order to organize synergy and fix headings and strategy to the high potential of this department.

8.3.8 Other issues

The panel was surprised that no advantages or disadvantages of the presence of SCASS in Uppsala were mentioned in the background material, nor raised in our discussions.

Rules and procedures for admitting doctoral students (and postdocs) from other universities should be clarified and efforts to attract them should be increased.

The advantages and disadvantages of professional social work teaching in this department should be reconsidered carefully in view of its impact on developing research activities.

8.4 Division of Media and Communications Science, Department of Information Science

8.4.1 General remarks

See initial "general remarks", particularly valid for this unit.

8.4.2 General assessment

The enthusiasm of the group of scholars from this small unit impressed the panel. However, the unit seems to lack resources for clear leadership. Individual members of the division take research initiatives over a broad scale, partly in their spare time, in encounters with e.g. the media developments initiated by digital technologies, media studies in Tanzania with connection to networks on Africa studies, new forms of journalism, and human-computer interaction (HCI). However, these research activities are apparently quite disparate. Consequently, this unit does not show a coherent profile. Uppsala University could not be taken serious when a range of research topics within the wide interdisciplinary field of media and communication studies should be covered by a total of 50-60 percent of only one FTE of research. However, the recruitment of qualified PhD-students adds to this percentage and gives the unit some potential for future-oriented research informed by a more international orientation. The lack of indicators and figures on the present situation did surprise the panel.

8.4.3 Quality of research

The set-up of the KoF does not allow a well-founded judgment on the substantial quality of the research. The initial intention to let media and communication studies meet computer science and primarily HCI within the new Department of Information Science has a potential that never really has been materialized. Despite the good individual research initiatives and their accompanying cooperation with researchers at other universities, the division under its present conditions is not able to reach an internationally recognized standard.

8.4.4 Research environment and infrastructure

Positions that are kept vacant in (social scientific oriented) computer science and HCI, as well as the lack of resources for this unit itself make it nearly impossible to tap the synergies for media and communication studies within this department. However, the unit itself does not see new options outside this departmental construction. They expect the positions to come and they rely on creativity from PhD students to come up with the synergies between the various units within the department, especially HCI. The panel finds this very optimistic.

8.4.5 Networks and collaborations

The unit relates to journalism, media and communication departments at other Swedish universities and has some interesting international links. However, collaboration with related groups at other departments of the UU seem weak.

E.g. due to lack of time capacity the unit shows no interest or initiative towards the new Department of Studies in Education, Culture, and Media.

8.4.6 Opportunities for renewal and emerging science

The panel sees three options for the UU in relation to research at/from this unit:

1. Provide them with enough resources to build a viable university department. A popular undergraduate program in Media and Communication Studies motivates this option.
2. Move the unit into a larger group. It should not be the Department of Sociology where the unit came from, as this department does not have resources to host it.
3. To stay within the Department of Information Science but better integrated with HCI as well as computer science.

The unit itself considers the third option as the one they want and see possible, whereas the panel considers the other two as the only viable alternatives. The panel finds substantial organizational changes necessary.

8.4.7 Actions for successful development

Regardless of which option that is chosen, the research coming out of this unit has to be more focused in order to match the resources available as well as to keep international standards of research in this field. In any case there is a strong need for clear leadership of the unit. The panel considers it difficult to build a viable bridge to research in HCI unless the UU puts in considerable amounts of resources. A concentration on research-based innovative journalism may be one possible direction. Development of journalism research was required in the last national evaluation of journalism, media and communication. However, this or any other solution would require substantial additional funding and support to become viable, including the establishment of a chair as a focal point. As one of the principal universities in Sweden UU should have a strong position within the field of media and communication studies.

8.5 Unit of Food Sciences and Nutrition, Department of Domestic Science

8.5.1 General remarks

See initial “general remarks”.

8.5.2 General assessment

The unit appears to be a well integrated cross disciplinary unit, with a very clear and deliberate research focus. The research aims at offering inspiration and new perspectives for the educational programs of the unit and the professions that are graduating from the department (Dietetics, Food and Nutrition, Catering Management and teacher education). The research is mostly of an applied character and the unit demonstrates a clear engagement in addressing societal problems emerging in the field of food and meals - more specifically health and welfare problems related to food habits among the elderly and among children and youth. The research of the unit has moved from a focus solely on sensory methods and food quality adding a more social science oriented interest in factors influencing people's food and meal habits. Still, the research is cross-disciplinary integrating food, health, dietetics and sensory-science with social and cultural perspectives and methods.

In spite of very few permanent resources for research the unit has been very successful in building a small but lively research environment, by achieving research grants from external funding including EU and by integrating food researchers from other units of Uppsala University in their seminars. The unit thus appears to have a good integration between young and senior researchers. The staff is all female, which reflects the internationally well known tendency that almost only women study food from a meal perspective. The leadership of the unit stands out as very clear, strong and strategically efficient.

The unit is, in the view of the panel, a golden nugget in itself.

8.5.3 Quality of research

The set-up of the KoF does not allow a well-founded judgment on the substantial quality of the research. However, the material provided by the unit demonstrates a successful record of competing for research funding, for winning research grants from the EU and for publishing the unit's research in the recognized international journals and in important edited books in the field of food studies. The move towards integrating social science methods in the study of traditional natural science topics (such as hygiene e.g) appear to have a potential for generating new and fruitful ways of addressing major food safety and health problems. The unit has very effectively disseminated research results and ensured that they are put into practice in relevant fora. In the future, the research could benefit from developing a stronger theoretical orientation of research.

8.5.4 Research environment and infrastructure

The unit is looking forward to being separated from the textile unit, as there is no connection between the two. The unit is placed within the bio-medical centre building which is valuable since it provides a valuable campus environ-

ment, highly valued by the students, and offers good opportunities for collaboration with neighboring disciplines. A sensory laboratory and a test kitchen are to be established once the building where the unit was placed is renovated.

The unit runs seminars about food studies for their doctoral students and has integrated doctoral students from other departments too, who have projects related to food. There appears to be good exchange with competences in similar departments in other Swedish universities, and there has been some exchange students from other European countries.

8.5.5 Networks and collaborations

The unit has shown an excellent ability to draw upon expertise in other departments of Uppsala University, not only with respect to teaching but also in terms of collaboration and shared supervisions of phd-students. The unit appears to have well established international contacts, have participated in collaborative European projects and networks and work closely together with partners in the Nordic countries.

8.5.6 Opportunities for renewal and emerging science

The panel agrees with the unit's plans to focus on the areas of youth and old age in future research. This will serve well as a basis for cross disciplinary research as well as for addressing both public and private meals, and both the public welfare state sector and the commercial sector. The unit is planning to develop an application for a joint research program in this area, and the panel sees this as a promising step forward to integrating the disciplines of the unit even further.

8.5.7 Actions for successful development

The success of this unit appears to depend very much on the enthusiastic staff and good leadership. The resources of the unit are scarce and as a small unit close to the critical mass limit, it is fragile. The risk of burn out of important staff must be considered by the university. The panel suggests that the university take serious steps to protect this unit in order to make it more robust. A new senior lecturer to be hired will help. But the panel thinks it should be considered whether moving the unit to a larger environment (e.g. the public health and caring department) would bring benefits in the form of a broader basis for services and a closer contact with neighboring disciplines. This could take some administrative burdens off the shoulders of the present staff. The panel wants to underline, that it is important that the unit stays an entity - it is a unique unit with good potential and should be valued and kept as such.

8.6 Department of Education

8.6.1 General remarks

See initial “general remarks”.

8.6.2 General assessment

The overall research profile is diverse. The major part of the research activity in the department is, however, organized in four research groups indicating areas of priority. The overall impression is that the research in the department is well organized. The academic leadership and the collective intellectual creativity and productivity seem to function well, especially inside two of the research groups. However, education as an academic discipline consists of several sub disciplines. A thematic organization of the research might lead to an underinvestment in more basic disciplinary updating and renewal. Little coordination and attention to this problem both inside the department and the Faculty of Educational Studies/Sciences seems to be a problem.

8.6.3 Quality of research

The overall impression is that the research holds internationally high standard. Educational policy studies and studies of childhood, learning and identity are “golden nuggets” that deserve strategic attention from the department, the faculty and the university.

8.6.4 Research environment and infrastructure

The research unit for *Studies in Educational Policy and Educational Philosophy (STEP)* carries out research on educational policy, politics of education and educational philosophy. The group has initiated a number of externally financed projects, it is highly productive and performing at an internationally high standard. The group is led by a well established and internationally recognized professor. The theoretical and methodological profile of the group is well defined and coherent. Doctorial training and postdoctoral research is well integrated in the research and other activities. The future prospects seem to be promising. Educational policy studies and research underpinning educational reforms have historically a strong position in Swedish educational research. However, the position of policy orientated research at the macro level holds a weaker position in current Swedish educational research. Thus the work of the group is important with regard to sustaining and further developing this important research area within educational studies. The research projects are internationally orientated through networks and international cooperation. Seminars, a Web site, an electronic journal, a report series and international thematic conferences contribute to a dynamic research milieu. The activities

of the group were previously financed directly from the Ministry of Education. Since 2005 activities are carried out with support of the University and The Swedish Research Council.

Studies in Everyday Life: Interaction and experiences in educational settings (ELSIE) is a newer research group led impressively by a younger professor recruited from another university. The research is directed to studies of childhood, learning and identity as socially situated and constituted phenomena. The theoretical and methodological profile of the group is well defined and coherent. Doctorial training and postdoctoral research is well integrated in the research and seminars. Projects are addressing children's identity work and peer-group interaction, micro-interactional research on learning and remembering, equity in education and children's rights. The group is highly productive and publishing in recognized international journals. The group has been very successful in initiating projects and obtaining external financing. The lack of support from the university to a newly recruited highly competent, creative and team-oriented scientific leader, is however disappointing.

Studies in Higher education is a relatively smaller research group involved in studies of higher education as a system and social institution, the interaction between external and internal conditions, and the outcomes of higher education. Traditionally studies of higher education have not been on top of the agenda of educational research in Scandinavia. The department deserves credits for addressing this important area of research in the aftermath of massification of higher education. The research is addressing important social, political and educational questions. The research is, however, quite disparate. The group seems to be more of an administrative umbrella than of a coherent research community. The dialog with the European and international research community in higher education studies should be strengthened.

Ethos in Society, Education and Practices (ESEP) consists of a small group of researchers focusing on social practices. The group's research profile is diverse. However, the group is conducting interesting research on professional identity and challenges. A further development of the research towards comparative and studies of professional education (teachers, nurses, social workers etc), could be promising. A common theoretical framework for the research should be strengthened. The size of the group is small and hence vulnerable. The department should address the question of critical mass.

8.6.5 Networks and collaborations

The overall impression is that the degree and quality of international and national collaborations and networks are functional and productive.

8.6.6 Opportunities for renewal and emerging science

The relation between Department of education and the departments within the Faculty of educational studies is a challenge as the academic synergy is by far optimal. The new construction of Pedagogicum is, however, promising for renewal of cooperation and integration of educational research at Uppsala University. In general all research groups within the Department of education could benefit from a closer and more dynamic relationship. More specifically Pedagogicum and a closer organizational and substantial relationship could contribute to the enhancement of research-based professional education, professional studies, the combination of micro - macro perspectives in educational research and studies of use of ICT in education, instruction and learning.

8.6.7 Actions for successful development

- a. Strengthen the ambition to organize research activity in research groups addressing topics of priority across the existing departments in the area of educational studies.
- b. Coordinate and nourish basic theoretical and methodological development through viable bridges between research groups involved in educational research, eventually by adding staff (professorships) primarily devoted to these issues.
- c. Develop a strategic plan that defines and synchronizes incentives, support and supervision at university level, faculty level and department level to promote research quality within the areas of priority.

8.7 Department of Curriculum Studies

Faculty of Educational Sciences

8.7.1 General remarks

See initial “general remarks”, clearly valid for this unit.

The Faculty of Educational Sciences is not defined or recognized by the university as a scientific field in itself, leading to budget constraints. This can not be considered fair or serious, that the university treats one of their faculties as an exception, and still expect research.

8.7.2 General assessment

The Department of Curriculum Studies is one of two research departments within the Faculty of Educational Sciences, which is covering teacher education at UU. In its current form the department was established in January

2007. The Swedish name of the department is “Institutionen för didaktik”, which according to international research traditions denominates a different field, more closely focused on issues of teaching in theory and practice.

The research activities at the department cover a wide range of curriculum issues. Most of the research is embedded in two research milieus, one dealing with “Studies of Language Practice” (STOLP) and the second with “Studies of Meaning Making in Educational Discourses” (SMED). Both state as starting point for their research a focus on “institutionalized content” (educational, teaching, learning etc. content) and on educational processes (such as teaching, learning, socialization). The current research of the STOLP group looks into different aspects of children’s and adolescents’ language practice in and out of school. The SMED team focuses on institutionalized educational discourses and the interplay of individual, social and institutionalized conditions of meaning making, often with special regard to science teaching and learning.

Based on their research, both research leaders are often called upon by committees, public administrations and agencies, and by other institutions of educational research and teacher education.

Both research areas require inter- and multidisciplinary research, which the department organizes by widespread cooperation with researchers from other fields and institutions. However, as important language and science as school subjects are, they are but two of the wide array of curriculum issues pertinent in a Faculty covering all levels of teacher education. Any thematic bundling of this kind may lead to that other fields of subject matter as well as the general issues of schooling, teaching and learning (like equity issues, migration, diversity, special needs etc.), which are of high importance for all research based teacher education, could be left out or reduced to minor add-ons within the main areas. There is awareness for these shortcomings at the department. But given the current resource situation, there are not many possibilities to change this from within. Some of these issues are dealt with by the research on educational matters established at other faculties, but there - it seems - more often than not without special reference to the needs of a research based teacher education.

8.7.3 Quality of research

All in all, the department has the equivalent of 1.5 FTE based on its institutional budget. All other research is financed by external support, mostly research grants from the Swedish Research Council, to a lesser degree from other public funding. Taking this limitation into account, the quality and amount of research activities is quite impressive. The research is addressing important educational and social questions based on coherent and well established theoretical frameworks. Both research groups are well recognized within Swedish and Nordic educational research. Some of their results have been published and well received internationally.

8.7.4 Research environment and infrastructure

Both research groups function as other research groups at other institutes, e.g. the Department of Education within the Faculty of Social Sciences. They pursue their own program and seem to profit from the interaction with other research carried out at UU. Even their relation to teacher education is not much different. It is based on the focus and content of the research issues, not on a widespread involvement of the teaching staff (lecturers) at the department or at the other units of the Faculty of Educational Sciences.

This seems not at least due to the current resource situation. As said above, most of the research is based on external grants. Only to a limited extent the research money acquired by the groups is spent at the department itself. Most research activities are based on networks with other research units at UU and at other universities or university colleges (e.g. at Örebro, Mälardalen, Linköping, Stockholm) and with national institutions such as the Swedish National Agency for Education (Skolverket). It is argued, that one reason for this is that the overhead required by UU makes it difficult to place more research activities within the department. Thus only extensive networking allows these rather small groups of researchers to be part of activities on a much larger scale and at a higher level of research interaction than otherwise would be possible. Likewise Ph.D. students connected to the department get a wider audience and access to diverse and challenging research milieus by this strategy. However, this implies that only little of the research resources can be made instrumental for a broadening of the department's own capacities to sustain a high level of research quality. Moreover, this leaves most of the teaching staff in teacher education behind, all those, who do not have substantial research time as part of their current positions and no sufficient research education. Thus, the department lacks internal resources to utilize its own knowledge growth in a systematic way for the teacher education provided.

In the area of research education (seminars), the department cooperates with the other education departments within the Faculty of Education Science (Department of Sociology of Education and Culture) and the Faculty of Social Sciences (Department of Education) and it is part of the Research Collegium for Educational Research at UU.

All in all the infra-structure seems not to be sufficient, when the aim is to build up sustainable research capacities within the department and to contribute to a research based teacher education at the same time.

8.7.5 Networks and collaborations

The department seems to be very well connected within the Swedish as well as the Nordic research landscape. In addition, the lead researchers of the department are very actively participating in international research activities, not at least based on the involvement with international research programs like

PISA, TIMMS and PIRLS. However, the role of visiting scholars seems to be rather limited and based on personal contacts and networks.

8.7.6 Opportunities for renewal and emerging science

Being a very young department, quite a lot of activities have to be devoted to consolidating the new unit. However, to achieve this, the department is also rethinking its current division of research. For instance, the future aim of integrating some of the research of both groups with a focus on the conditions and constraints of acquiring science literacy could help the department towards better synergy, and at the same time develop its research into a significant contribution to international research

Another strategic initiative of the department is the work towards an Institute for Research on Education and Sustainable Development (in cooperation with research groups at other Swedish institutions). It shall include the Nordic master program and a research school.

8.7.7 Actions for successful development

The department is doing as good as one can expect with its very limited research resources or even better. Any attempt to improve the quality and to broaden its activities, for instance towards covering the neglected fields of curriculum studies (such as inclusive education or migration issues), would require a substantial input of research and administrative capacity. Taking the special situation of the Faculty of Educational Science and the field of curriculum studies into account, a temporary reduction of the overhead could be one step towards improving the competitiveness of the department and to allow for more internal capacity building. A second step could be to strengthen the requirements concerning the research qualifications of lecturers and senior lecturers, and to provide additional research education and incentives for this group.

8.7.8 Other issues

As is the case at the two other educational departments, much hope is put into the Pedagogicum as a new space for synergy and interaction. However, a successful start there will require addressing structural issues between the education departments (research groups and/or departments) as well as concerning the status of educational research and teacher education at UU as a whole. If UU wants to achieve both, lasting educational research of high international standard and a spin off effect towards a research based teacher education, fresh resources aiming directly at strengthening the interplay between these aims seem to be of utmost importance.

8.8 Department of Studies in Education, Culture and Media, Faculty of Educational Sciences

8.8.1 General remarks

See initial “general remarks”.

The Faculty of Educational Sciences is not defined or recognized by the university as a scientific field in itself, leading to budget constraints. This can not be considered fair or serious, that the university treat one of their faculties as an exception, and still expect research.

8.8.2 General assessment

The department which previously was called SEC appears to be a well integrated cross disciplinary unit, with a very clear and deliberate research focus : Its main focus is study the area of sociology of culture, sociology of education, and digital literature. In addition they are in charge of a national graduate school in history of education. This research department has also initiated a Collegium for educational sciences at Uppsala University. Characterized by the strong leadership of a professor who is highly recognized at an international level, this research unit works as a “scientific laboratory”: that is a specific theory of the social world inspired by Pierre Bourdieu and new forms of cultural capital, creation of databases, uses of factorial analysis and geometric data analysis, prosopographical methods. These approaches are very relevant for this kind of research. Among the fields, the first one is sociology of culture. The second one is sociology of education which concerns studies on recruitment, the education strategies of different social groups and the struggle between education and institutions. Both these research areas are very well established since many years within the unit. They have inspired many of the researchers in Sweden and internationally. However, the profits of collaboration between SEC and Teachers education appeared to be weak.

8.8.3 Quality of research

This way of exercising and developing sociology has given the department the department a strong international recognition, especially in France, in Russia and in Great Britain. The Department has been very successful in creating a rich research environment by achievement of research grants for example from the Swedish Research Council. The unit has a comparatively large staff of senior researchers, junior researchers and graduate students. The panel considers this unit a “golden nugget” within the Faculty of education and sciences. We would especially like to emphasize that this department, together with other disciplines applied for the prestigious Center of Excellence, the so called Linnaeus Grant for which it was highly ranked. The research group will therefore apply a second time.

We recommend UU to support them in their efforts to receive this grant. The research group has published extensively in international publications especially in French.

8.8.4 Research environment and infrastructure

The intellectual climate seems very attractive for doctoral candidates. Also, the infrastructure seems to be satisfactory.

8.8.5 Networks and collaborations

The overall impression is that the degree and quality of international and national collaborations and networks are functional and productive. The network is not an international standard network, mainly oriented towards the anglo-saxon scientific community. It also has its focus on central Europe as well as established local networks with other educational actors within the Swedish academic community.

8.8.6 Opportunities for renewal and emerging science

It appears to us that the main activities of this department are tightly associated to the theory of Bourdieu and to the founding father of this field in Sweden. So, there is a risk that when he retires there will be no successor. The theory could become a kind of routine closed in itself. It has happened in others countries. To avoid such unfortunate prophecy, we trust the Collegium for educational sciences at Uppsala University as well as the numerous junior researchers in this department. The panel appreciates very much the strategic initiative of the Department to integrate issues concerning education into the whole University.

8.8.7 Actions for successful development

If the main objective of the research is to describe the new forms of cultural capital, then the unit and his researchers have to work hard to give a real content to empirical studies on media. The panel had difficulties to identify how these topics should be developed in the future. In the documents, we did not find any concrete empirical attempts of how to study the field of media. Today, the department is not up to date on these issues. For example, it is necessary to understand the basis for how different social groups deal with media, such as TV and ICT. The panel welcomes a professorship in children and youth studies with a particular focus on media, in order to broaden the research agenda.

8.8.8 Other issues

The new building under construction called Pedagogicum will collect all units dealing with educational research within UU and thereby profile the whole area of educational studies linked to teachers education. Even their relation to teacher education is not much different from their neighbor department. It is based on the focus and content of the research issues, not on a widespread involvement of the teaching staff (lecturers) at the department or at the other units of the Faculty of Educational Sciences.

9. Panel 4

Political Science: Departments of Government, Peace Research and Conflict Resolution, and Eurasian Studies

9.1 Introduction

Panel 4 tried to work according the principles of a book title published in one of the departments: “Justice and Fairness in International Relations”. This leads to certain preliminary considerations which apply to all the three departments:

1. Panel 4 *did not compare the three departments* because they developed under very different conditions - ranging from an old and established nucleus such as “statskunskap” to a new department such as the “Eurasian Studies” which changed its name and range of interests several times.
2. The *panel report template invited comments on research environment in terms of personnel composition and infrastructure*. All of us agreed that the position of the so-called “promoted professors” should be clarified, either as “normal” professors equal to chair holders, or as another type of academic personnel with title and expectations adapted to the work description. The dual nature of professorship in the interviews proved to be a cause of unnecessary strains.
3. A sufficient part of the *funding should be basic, long-term and stable*, making a predictable recruitment policy possible. This goes for an extended number of doctoral students, particularly in those areas where this recruitment base is quite narrow, and also for an extended range of post-doctoral fellowships for the most promising candidates. Such a policy requires a more long-term strategy for the future profile and development of the department.
4. All the *departments suffer from great overhead-costs* for the funds they raise from outside. On the one hand there is a push for more applications for money, on the other hand the benefits of this time-consuming communicative work are endangered by too heavy “university taxations”. While it is obvious that the University charges an overhead for the external grants, the current system does not appear

to treat departments quite fairly. It would be advisable for the University to develop a policy of charging overheads that would be fair and benefit both the University and its departments receiving external grants.

5. Over the years, the departments seem to have developed an identity of their own to the point that *any effort to merge them would be counterproductive*.

9.2 Department of Government

The Department of Government is a quite large department with a long tradition. There are 77 employees, including three chairs, 3 promoted professors and 9 associate professors. There is also a strong hierarchical legacy with the prestigious *Skytte professorship* on top, and the promoted professors with a more heavy teaching load. In formal terms, however, the Department is headed by a prefect who is an associate professor with little authority in matters of research profile and priorities. The research at the Department is roughly divided into:

- democracy and democratisation,
- political economy and the welfare state,
- political sociology, with political participation and citizenship,
- developmental issues,
- international relations.

The Department is one of the few major political science departments in Sweden. It is therefore under a heavy obligation to cover a wide area in teaching as well as in research. The wide range of topics is partly a consequence of this, and partly a consequence of traditionally great autonomy for individual scholars to set their personal research priorities. The wide range of topics is also witnessed in the Department's publication list. The Department researchers publish in many international journals and edited books covering very different research areas ranging from International Relations over EU-studies, Developmental studies, political participation, political institutions, political economy, to political theory. Traditionally the Department had a strong tradition for publishing heavy monographies but the younger staff members are increasingly publishing in high ranked international peer reviewed journals.

There are several core areas, with clusters of interrelated projects, where the Department seems be particularly strong:

1. One areas is on the *foundations of and challenges to the working of national democracy*, partly in the direction of trans-national models like the European Union, and partly stemming from the emergence of a multinational society with problems of integration and group participation. The challenges to democracies from these to post-national

developments is an area where the Department already has a strong profile, and which calls for further resources in the future.

2. The other major area seems to be the *welfare state and the Swedish - or Nordic - model*, with a range of rather closely related projects within a common framework. This is also a very promising area for future research, as the theoretical and practical interests of the Nordic model - and the strains to this model - is growing in many other parts of the world.
3. A third, but related area is *citizenship studies* focusing on individual level behaviour and civic attitudes. The Department has since the late 1980s been host of a number of large citizenship studies creating valuable time series on participation and attitudes. In later years this research effort has been enlarged in two directions: first, the idea of citizenship studies has been exported to other European countries resulting the creation of strictly comparative datasets in 12 countries; Second, several projects have focused on Sweden's immigrant population, contributing important new information about the political integration of immigrants in Sweden.
4. The other major topics seem to be characterised by more individualised efforts where the unifying thread is harder to discover. Research of a rather high standard in various projects within *development studies* bear witness of this, and so do different interests in *international relations* - ranging from issues like crisis management, foreign policy analysis and international relations theory. In some of these areas, researchers in the Department show a high level of international activity. Most of the research activities at the Department are fairly strongly internationalized both in terms of cooperation and publication and have acquired important positions.

The Department is facing a period of transition with major figures close to retirement, including the Skytte chair. The attitude to a strategy beyond this transitional period seems fairly laidback, perhaps due to a combination of structural peculiarities:

1. One being the *discrepancy between symbolic and formal leadership*,
2. another factor being the *antinomies with the academic hierarchy*,
3. a third factor is connected to the *values of individual autonomy*,
4. a fourth one being the *lack of control over important input factors* connected to funding and systematic recruitment from below.

In the light of a need for clarification of leadership roles we suggest that the *symbolic and formal leadership should merge* one way or the other, with one set of institutions responsible for strategies and priorities within the Department.

The Department of Government seems to be a vital research environment with extensive output on a high level, open to cooperation within and to the outside, but with room for improvement in terms of a clearer and more inte-

grated leadership structure, in terms of changes to the anomalies in the academic hierarchy, and in terms of a more explicit strategic horizon connected to the transitional challenges on the one hand and the recruitment policy on the other. A part of this strategy hinges upon the possibilities for a predictable funding environment and a leeway for recruitment from an adequate base of PhD.s and post doctoral fellowships.

9.3 Department of Peace and Conflict Research

The Department of Peace and Conflict Research has evolved since the late 1960s from a modest teaching program into a full-fledged institute in the field. It is only one of the two institutes of its kind in the Nordic countries that combines academic teaching and degree-granting at all levels with a vigorous research agenda. The Department is relatively young, its first chair established in 1985 and its second in 2003. Its first Ph.D. candidates were admitted in 1986. The undergraduate education includes now all levels, including those required for admission to Ph.D. studies. Admissions have varied over the years, largely reflecting fluctuations in the externally available resources.

The research agenda of the Department focuses primarily on the causes, processes, and consequences of the organized violence. Department's *resources* are limited and well over 40 per cent of its three-million Euro budget comes from external sources, almost all of it from competitive research funding. The ability to raise external funds is, of course, a positive factor as it shows the quality of the Department's performance, but at the same time it makes the long-term planning of activities difficult. While it is obvious that the University charges an overhead for the external grants, the current system does not appear to treat departments quite fairly. It would be advisable for the University to develop a policy of charging overheads that would be fair and benefit both the University and its departments receiving external grants.

Due to the heavy dependence on external grants, the *research careers* in the Department are even more precarious than in most other institutions of the University. To make careers more sustainable, it would be useful to establish more time-limited postdoctoral positions and, over time, permanent senior positions. This would provide an opportunity to commit the new generation of bright young scholars more effectively to the Department and offer the doctoral students consistent advice in thesis writing.

Today, the teaching programs of the Department of Peace and Conflict Research are relatively separate from the programs of other departments, although the joint courses in social science methodology appear to be useful. *The relations between the adjoining departments are not particularly close*, but they appear to work reasonably well independently in key issues. Over the years, these departments seem to have developed an identity of their own to

the point that any effort to merge them would be counterproductive. A few projects of joint collaboration have appeared over the years building on the different profiles of the Departments.

The new generation of scholars has been mostly educated in the Department's own *Ph.D. program* that has produced at least five Ph.Ds. since the start of 2006 and a total of 31 Ph.Ds. since the first exam in 1992. Now the total number of active full-time Ph.D. students amounts to eleven of whom as many as nine are women. The average age at which the doctorate - 36 years in the period 2001-2005 - is earned is rather high, but the figure does not appear to differ significantly from other social science departments. Today a majority of the present 11 Ph.D. candidates are likely to finish within the next two years their studies which has problematic implications for the future.

The Department has in its activities a *strong international orientation* that is visible both in the networking patterns, field work by the students, and publication activities. In recent years, there has been a positive move from in-house reports to publish more through internationally recognized publishers and academic journals. This has helped to disseminate internationally the growing amount of research results produced by the Department's projects. This trend is consistent with the Department's new strategy adopted in 2006.

The Department has constructed over the last several years a *unique Uppsala Conflict Data Program (UCDP)* for which extensive data on inter- and intra-state wars have been collected, in collaboration with several institutions abroad. Also other kinds of data - for instance on peace agreements - has been gathered and included in the UCDP files. The Uppsala Program has developed from its modest beginnings with one participant only to include more and more resources, more and more categories, more and more variables, continuing updating and more researchers utilizing the data base in their work. Since more than a decade, the annual overview, normally accompanied by a deeper longitudinal analysis based on UCDP has been published in SIPRI Yearbook as well as Journal of Peace Research.

It is well known that these kinds of data sets tend to suffer from various problems of validity and reliability; yet, the value of UCDP is generally recognized as the most comprehensive collection of its kind and widely used by other scholars. The relevant publications have high citation figures that suggest their importance for the international scholarly community. Clearly, the development and use of UCDP has enhanced the international name recognition of the Department and of the University.

Uppsala Conflict Data Program faces at least two challenges. First, to be useful, the Program *requires continuous effort to update* the data and ensure their quality. Second, the data set has to be *utilized in further empirical research and theory development* also at Uppsala. The Department has now entered the phase in which UCDP informs much of its research agenda that is becoming increasingly interlinked and coherent. This means that the war data increasingly underpin research concerning such phenomena as the processes

and outcomes of peace negotiations, post-conflict politics (e.g. democratization), and the sustainability of peace agreements. It is important that the Department has an opportunity to continue the implementation of this research agenda.

On the other hand, there is the need to maintain the diversity of the research and teaching agenda. In the Department there is also strong theoretical and empirical expertise on, among other things, international negotiations and the relationship between environment, development, and conflicts. It is also in the interest of the undergraduate and graduate students to maintain and even strengthen diversity in research and in the classroom.

Against this backdrop, the assessors suggest that

1. The Department should *invest further in the development of a coherent and intellectually challenging research agenda*. Such an agenda would help to steer external fundraising and provide a framework for the further development of the Ph.D. program that has been clearly a success so far.
2. The Uppsala Conflict Data Program has made great progress and is a promising area for further development and investment. The Program has the potential to become in a short time a *flagship project* for the Department and the University. While maintaining the diversity of the research agenda, research work relying on the current data infrastructure should be encouraged, and it could be further deepened by comparative case studies.
3. The University and the Faculty should consider seriously the establishment of *more post-doctoral positions* to assure more sustainable research careers for the best students.

9.4 Department of Eurasian Studies

The Department of Eurasian Studies occupies a particular place in the university environment. It constitutes a traditional university department within the faculty of social sciences, but in reality it is an *area-focused interdisciplinary research centre* that also includes an undergraduate teaching program. Originally the Department focused on Central and East European Studies (Communist studies). In January 2006 the Department transformed itself from “East European Studies” into a Department of Eurasian Studies, including China, and Northeast Asia. Currently it deals with the Eurasian region.

The department went through several transitional stages. After the implosion of communism the department re-oriented its research to the outcomes of systemic change in the former Soviet-type systems, trying to explain the diverse outcomes in the region as to democracy, market economy and the rule of law. After the re-naming of the Department into Eurasian Studies a *“major leap”* was taken to the region of Northeast Asia and China. Basic research

on the outcomes of systemic change and comparative institutional developments remained one of the core activities of the Department. Besides this line of research a more policy-oriented interest came up, driven by external funding by the Swedish government. This research relates to the implications of “*pathological*” developments in the former Soviet space, e. g. the emergence of trans-boundary problems related to corruption and organized crime. It is implemented under the “*Silk Road Program*” which covers these problems along the old silk road countries. A cooperation with the Institute for Central Asia and the Caucasus of Johns Hopkins University has been developed (e. g. the co-editing of the “*Journal for Central Asian and Caucasian Studies*”). Besides these two lines of research, Ph.D. students from different departments brought the institute their specific issues on the Eurasian space related to *political development, nationalism, regional cooperation, mass media, crisis management, security and foreign policy, as well as the emergence of the rule of law*. This implies that the Department has a useful function as meeting place where disciplinary approaches can be combined with the insights based on area studies.

One has to underline the transitional situation of the Department. It had to reorient its research and educational activities towards new research domains, both in terms of geographical covering as in terms of the issues covered. Another aspect of the transitional situation of the Department is that retirement is close for parts of the faculty.

Nevertheless the Department has been relatively *successful in attracting external financing* (which takes about 60% of the budget of the Department). A recent development has been a major increase in external financing, caused by funds provided by the Ministry of Foreign Affairs for the development of China studies.

The research output is considerable as well. One can observe that part of the publications can be qualified as high standard international and peer reviewed publications, others can be labelled as policy-oriented and informative documents.

There are good arguments to keep this department going and to *leave it in its position among the other departments*. This department has the traditional advantages (and problems) of *area studies*: people know the languages and political culture, as well as the history. They can bring valuable insights on an area-based level, especially in the field of systemic “default”. But it is not easy to define institutional identity, especially in times of post-communist systemic transformation.

There are major problems in the reorientation of the Department, as China and Northeast Asia is included in the research agenda. There is no senior researcher at this moment whose specialty is China. On the other hand the recent additional external financing is provided for policy-oriented research in this region.

The Department should be very careful with the transition to China and Northeast Asia. A possible approach could be *to deal with the region from an Eurasian point of view, concentrating on Central Asia and the Caucasus*, and gradually moving to the Northeast Asian region via borderline problems. This implies not only policy-oriented research on “pathological” developments related to trans-boundary problems such as narco-terrorism, radical Islam and certain forms of organized crime, but also and primarily comparative research on institutional developments, combining the existing fundamental research on systemic transformation and institutional developments with the exploration of new regions.

The Department contains *promising areas* in the following respects:

1. *Russian studies are strong in several fields.* There is some work done to fit the concept of Eurasia into the history of ideas in Russia. Eurasia will become a new geopolitical concept after the collapse of communism. The interdisciplinary and comparative approaches can bring useful insights on institutional and security related issues in the future.
2. There is a *strong expertise on the Caucasus and Central Asia.* Security problems in the former Soviet republic of Central Asia, and in the relation with China and Northeast Asia will increase. The relevance of oil and gas resources and infrastructure in the region are equally relevant.

The institute has a strong potential in combining basic research on institutional transformation with a long term orientation with policy oriented smaller research projects, based on external financing. To develop along this two-track orientation the basic research should be protected through secured institutional funding, and should be given a long term perspective. The focus on system transformation and institutional developments of “*defective democracies*” can provide a breeding ground for a careful development towards an Eurasian approach. The policy oriented research on defaults of democracy building can also be framed into a general theoretical approach of institutional transformation.

9.5 Conclusions

Two indicators have been introduced which differentiate between:

1. well established successful research areas,
2. and areas promising for future research.

“Renewal” is not a goal “per se”: certain fields are of top quality such as:

1. *The areas concerned with “the state”, the welfare system and the new dynamics of the national state (migration, ethnic groups within the state - or challenges of the European Union from outside the system) in the department of government.*

2. *Areas with a continuously completed data base in peace research,*
3. *Long-term Eurasian studies* with approaches of institutional economics and path dependencies.

In all these cases the studies are successful and promising for the future at the same time. Another type of studies are *new initiatives of groups of young scholars* which have the virtue of not being built around one GOM (grand old man) and are more narrowly specialized. They are not yet “successful” but will be promising in the future. A promising research area in the Department of Government could be a *chair of modern political theory* which might help to integrate the theoretical outlooks of divergent fields of research.

There is another danger combined in the preoccupation with renewal. It is a fact that large parts of the young scholars permanently have to apply for grants and subsidies - thereby losing much time for research. This can entail the consequence that some of the *alleged innovations follow short-living fashions which fit the desires of funding institutions more than the development of political science.*

In the light of this dilemma all the three departments developed cooperation with neighbouring social and behavioural sciences - and created the “*Gamla Torget Forum*” as a centre for cooperation and help for young scholars and students which should financially be supported - especially regarding some secretarial and infrastructural facilities (similar favourable conclusions concerning GTF in the Report to “Krisberedskapsmyndigheten”: H. Wiberg: Utvärdering av project (Dnr 0265/2002, p.5).

10. Panel 5

10.1 Department of Psychology

10.1.1 General assessment

The psychology department as a whole is an outstanding department with several research constellations with the highest international competitiveness. The major research themes include infant cognition, cognitive studies of human judgment, affective neuroscience, chemoreception based perception and cognition, socioemotional development, cognitive behavioral treatment of chronic illnesses, music and emotion, and personality and prejudice. The department has been very successful in obtaining external funding. Over 30% of the departmental funds are matched by external funding. The department has had great success in its outreach to society and there are several examples where it has made significant contributions to education of the public.

The success of the research depends on the contributions from individual researchers. The main source of synergy stems from within research groups and their collaborations with international research groups. Inter- and multidisciplinary work is successful and encouraged but could profit from university-wide support for multidisciplinary research centers.

Research assignments from 20 to 100% of time are distributed to 36 persons, which makes about 22 full-time equivalent years of research. The number of publications in the years 2004 to 2006 was 76: 3.5 per FTE research year and 7 per 11 professors, which is excellent. It is highly commendable that the majority of publications are articles in leading international journals.

The demographic profile presents a problem in that many of the most significant researchers will retire within the next few years. Gender distribution of teachers and researchers is close to equal; 42% are females. Seven out of 13 lecturers are female but only 2 out of 11 professors are female, which leads to the fact that women spend significantly more time in teaching than in research compared to men.

10.1.2 Quality of research

The Department of Psychology is one of the very strongest in Nordic countries with several top-quality research areas. These groups publish in first rate journals such as *Nature Neuroscience*, *Psychological Review*, *Archives of General Psychiatry* and *Psychological Bulletin* and also in top level specialized

journals. The international visibility of the department is evidenced by active cooperations with other world leading centers.

The department has one of the world-leading laboratories on infant perceptual-motor behavior. This is an international frontline laboratory, in terms of the originality of research, empirical contributions and methodological inventiveness. The constellation participates in 3 large EU grants.

One of the strongest areas of the department studies is human judgment and decision-making and higher-level cognition. This group has an impressive publication record and has developed innovative theories, which have substantially advanced the field. As the group consists of comparatively young and very promising members, it could be considered to be a pillar for the future of the department.

Another top quality group in the department that focuses on affective neuroscience research has successfully built a research line on gene -imaging - behavior interactions in human fear and phobia. It is among the leading groups in this field with very high impact publications. Its strong interdisciplinary co-operations have allowed it to become a driving force for the planned Mind Brain Center of the University.

The longitudinal studies on socio-emotional development have made significant contributions to the field of child development and should be considered a very important asset to the department.

In addition to the mentioned areas there are a number of individual researchers who conduct science at an internationally high standard and contribute significantly to the scientific output of the department.

The Department has a well-structured program for doctoral training. The quality of the environment for training seems to be good and above national standard. This is indicated by the fact that the department has received 3 out of 4 awards from the Swedish Academy of Science (Committee for Psychology) for the best dissertations. The students give the impression of a liberal environment where personal interests can be pursued.

10.1.3 Research environment and infrastructure

The staff of the Department consists of 6 professors whose research assignment is 50%, 5 promoted professors with 20% research assignments, 13 lecturers with 20% research assignment, 9 researchers with 100% research assignment, 3 senior post docs with 80% research assignments, and 4 guest lecturers and 5 other persons without research assignments. The number of doctoral students recruited since 2002 is 41; 27 of them are paid by the Faculty of Social Sciences and 14 by external funding. The department has international collaborations with regular exchange of scientists and students and also numerous local collaborations.

The strong academic tradition is evident from the fact that almost all academic staff is active in research. Considering the future of the department, there are few internally funded early career opportunities for research. The lecturer positions could serve for recruitment of researchers if defined as assistant professor positions with a lower teaching load.

The Department has a chief administrator who organizes the work of the administrative and technical staff. One IT technician supports research and education. The internal technical (engineering, programming) and secretarial support for research is virtually completely lacking and presents a limitation to the productivity and quality of the research.

The infrastructure for research is not adequate compared to international standards and needs to be improved. Research laboratories have been built and are maintained on external funding which limits the updating of equipments. The laboratories are not designed for their present use and the planned relocation is urgently needed. Some of the equipment is in need of renewal. The relatively undeveloped infrastructure serves as a hindrance, but the researchers have in spite of this developed an impressive methodology, often based on outside collaborations.

10.1.4 Networks and collaborations

The top groups in the department have broad international co-operations with outstanding international research groups. Several intramural collaborations could serve as a model for other research groups within the University.

10.1.5 Opportunities of renewal and emerging science

The department is entering a dynamic phase as 4 out of the 6 chairs, 2 out of the 5 promoted professors, and 4 out of the 13 lecturers will retire within five years. This provides a challenge regarding knowledge management but also an exciting opportunity for renewal. Plans for long term renewal beyond the next five years need to be developed. However, for the near future there are several promising activities for renewal.

The work in infant cognition has risen to an internationally remarkable level and is moving in interesting directions such as method development with several companies. In addition, there are potential synergies with the groups working on developmental disorders and brain imaging. The involvement of the affective neuroscience group in the Mind Brain Center with its focus on translational neuroscience offers a unique opportunity for further development of the psychology department.

An emerging theme across several research groups is the study of emotional processing related to music perception, cognition, human development, and psychopathology. The research in perception/action and cognition provides a promising opportunity for the development of an integrated theoretical frame-

work. These areas have a number of common themes that could provide an opportunity for synergy.

The department has several promising junior researchers, which is an important intellectual capital for its future. The career development of junior researchers deserves more attention. Specific career planning should be offered to the most promising candidates.

10.1.6 Actions for successful development

A number of measures would be desirable to further successfully develop research in psychology.

- The psychology department needs a plan of development and structure for the next 5-10 years to achieve a smooth transition from a phase of a large number of retirements into an innovative future. This could entail a restructuring of the department into larger focused research units, possibly catalyzed by participation in interdepartmental centers of excellence. Some of the replacement positions could then be assigned to the research areas the department identifies as crucial and some could be left open for new research areas that future professors could bring in. An international advisory board could help in this transition process.
- A further improvement of the research would necessitate a more than marginal infusion of resources for research and infrastructure. This would ensure the maintenance and enhancement of internationally leading roles for the established research groups and the development of new research initiatives.
- Research groups would also benefit from access to psychometric and statistical expertise for the analyses of complex databases.
- Planned evaluation of the members of the department and distribution of funds based on explicit merit criteria such as external funding, high quality publication and successful teaching should be formally instituted.
- The low research assignment of promoted professors (20%) limits the qualified researchers' possibilities for research. The increase of their research assignment up to 50% as for the chairs would increase time for obtaining external funding and doing actual research work. This might be achieved by reorganization of the teaching, as the teaching load is relatively high compared to other successful departments of psychology.
- On the side of the university and the faculties, measures need to be taken to actively strengthen the exchange and cooperation between different research areas in the university. This would require the encouragement of dissertations to be shared between faculties. Moreover, it would be important for the leadership of the faculty to support

cross-disciplinary research by investing in technical support that can be drawn upon from different users.

- The University could consider co-organizing courses between the three psychology programs in Uppsala, Stockholm University, and Karolinska Institutet.

11. Panel 6

11.1 Introductory remarks

1. In the absence of clear criteria handed down to us as to how to interpret the four “grades” suggested in the Terms of Reference, we decided to interpret them according to our own lights, making sure to scrupulously maintain internal consistency.
2. We basically interpreted the four grades as follows:
 - Acceptable: what one is entitled to expect from a major university.
 - Internationally recognised standard: doing good work, along generally accepted paradigms, accumulating scholarship, but without being really innovative as to theory or method.
 - Internationally high standard: introducing new methods or theoretical thinking, providing scholarship that sets the standard also for others.
 - Top-quality, world-leading research: developing new paradigms, new theories, new methods, not only contributing to the development of the discipline, but leading the field.
3. We found that the smaller the unit to evaluate, the more specific our evaluations became, and this may have led to some imbalances.
4. On the whole, we found university infrastructure to be adequate, even good to excellent. For this reason, we do not comment on this point for all the individual units. More generally, it should be added that library charges were burdensome for the departments, according to information we received during site visits.
5. While we thought that the rather extensive generational turnover now under way, especially in the higher echelons of research personnel, would create opportunities for renewal and re-orientation, in many cases we found the unit concerned to rather adopt a “wait-and-see” attitude, defensive rather than pro-active.
6. We think that in the present circumstances a greater degree of active leadership in setting out lines of research, integrating what are often adjoining activities in units and departments, may be called for in order to realize the full potential of the university’s resources. In

our opinion this also extends to the recruiting of both staff and PhD students.

7. For future development, it is important to make sure that all categories of staff get sufficient time for research, including promoted professors and junior members of staff.
8. The new organization of departments seems to work, but cooperation within and across departments could be further developed. We welcome the SALT and EPARIT initiatives as platforms for cooperation within the faculties of Arts, Languages and Theology.
9. We found a rather high degree of internal publishing to be the custom in many units. While we do not wish to dispute the relative, and in some cases absolute, merit of in-house (i.e. Uppsala University) series and journals, we do think that it would be good policy to encourage a higher degree of internationally competitive publication with outside publishers.
10. We regret that for the publications, especially major ones, listed for the various departments and units no references to, citations of, and excerpts from, scholarly reviews were provided - to have done so would have helped us in gaining some broader idea of the impact of these publications upon the scholarly community.

11.2 Department of English

11.2.1 General assessment

In our assessment we will comment separately on English Literature, American Studies, and English Linguistics, on the basis of our interviews and the material that has been provided.

English Literature

As far as publications realized, PhD degrees granted, and current projects running go, the strengths of the English Literature unit are to be situated in two specific areas: the Renaissance and Early Modern Period, and the early twentieth century. In both fields work done at the unit largely follows established methodological and critical paradigms. The unit has been successful as a provider of researchers and teachers to other university departments of English around Sweden.

At present there is no Chair in office. The former Chair and the Head of Department released some information on the likely new Chair, and on the research priorities the latter might set. Still, this remains speculative as long as no appointment has been made. The only certainty is that it will be an appointment in English Literature before 1900. The unit looks upon this as a strategic choice with regard to Uppsala's positioning itself within the general field of English literary studies in Sweden.

American Studies

This unit comprises two sub-units, viz. American Literature and SINAS, focusing on the study of American history and society. It has to be underlined that Uppsala has the only Chair of American Literature in Sweden.

The unit concentrates as a matter of strategic choice on the United States and on the twentieth century. The dual emphasis on literature/culture and recent history has led to some collaborative research and publications, particularly in the field of Swedish-US relations. Recently, a line of research was started up, applying quantitative-analytical methods and computer-based research to questions of authorship as related to developments in society. Even more recently, research was initiated into verbal-visual cross-over phenomena, also in the newer digital media. All this gives American Studies at Uppsala a distinctive identity, pioneering new methodologies, allowing for interdisciplinary research, and opening up possibilities for increased collaboration with other units in the Department as well as with Comparative Literature and Art History.

English Linguistics

The profile of the English Linguistics section is empirical research based on electronic corpora, compiled at the department and in collaboration with an international network of scholars in the field. The corpora are of three main kinds: (1) historical corpora; (2) present-day English corpora; and (3) learner corpora. The dominant field is in historical corpus studies, where there is a great deal of activity. The focus on language variety and change brings new perspectives on language development. Of special significance is the current work on speech-related genres, including the building and editing of a corpus of English Witness Depositions, a project which is of historical-cultural as well as of linguistic interest. The work in English historical linguistics at Uppsala University is well-known internationally. The English Linguistics section has been successful in producing doctoral dissertations. The prospects for further development are good.

11.2.2 Quality of research

English Literature

Much of the work is of an internationally recognized standard.

American Studies

Much of the work is of an internationally recognized standard, coming up to a high international standard in research into authorship and authority. Verbal-visual research shows promise.

English Linguistics

Much of the research in English Linguistics is of an internationally recognized standard. In the field of English historical linguistics the research in the department is clearly dominant in Sweden. With respect to the building and development of historical corpora, researchers within the department play a leading role internationally. Conclusion: the research in English historical linguistics is outstanding. Rating of this area: internationally high level.

11.2.3 Research environment and infrastructure

In English Linguistics there is a mix of older and younger researchers, which provides a good research environment. In the fields of English Literature and American Studies, the research environment suffers from the fact that important posts are vacant or are in the process of being filled (see below).

11.2.4 Networks and collaborations

Within the field of corpus studies, there is a well-developed international network (ICAME: The International Computer Archive of Modern and Medieval English, established in 1977). The holder of the chair in English Linguistics has an important role in ICAME, as a member of the Board and editor of the journal of the organization.

11.2.5 Opportunities for renewal and emerging science

English Literature

Much will depend on the new Chair. If the candidate expected to be victorious indeed accepts the appointment, it is likely that this will result in an increased use of computer analysis of corpora for earlier literature, and a turn toward ecocriticism and the analysis of digital media. These developments, if achieved, will allow for increased collaboration with other units and departments at Uppsala, notably English Linguistics, American Studies, and Comparative Literature.

American Studies

The recent emphasis on digital media sits well with developments elsewhere in Scandinavia, with literature, media and culture studies being increasingly integrated. Strategically, this seems a good move in a country that houses some of the world's most innovative companies in the field of digitalization and new media.

English Linguistics

Researchers in English linguistics are involved in a number of forthcoming innovative projects: The Shakespeare Dictionary project, in collaboration with

colleagues at Lancaster and York Universities; the Early American English Corpus 1620-1800; further development of the Corpus of Nineteenth-Century English; etc. As the large-scale corpus projects are completed, there will be excellent opportunities for carrying out studies representing different time periods and varieties of English. It is also significant that scholars within English Linguistics are involved in the planned Linnaeus Grant project (see our report on the Department of Philology and Linguistic, C5).

11.2.6 Actions for successful development

English Literature

Speedy appointment of new Chair.

American Studies

Speedy taking up of office by new Chair.

English Linguistics

It is important to make sure that the section can maintain its leading role in historical English corpus linguistics.

11.3 Department of Linguistics and Philology

11.3.1 General assessment

The department was formed out of its units as recently as January 1, 2004. In our assessment we will first comment separately on Turkic and Iranian Languages, Computational Linguistics, and General Linguistics. This will be followed by some remarks summing up our impressions of the whole department, on the basis of our interviews and the material that has been provided. Swahili and Chinese will not be commented on, as at present they are marginal from a research perspective.

Turkic and Iranian Languages

The department is in a fortunate position compared to most institutions at European universities where Oriental languages are represented, in that both Iranian and Turkic languages are included. This has resulted in fruitful research cooperation between the two fields, which is especially significant because of the linguistic and cultural interaction that has taken place between Turks and Iranians through history. The cooperation between the scholars in the two fields is conducted mostly within the framework of recent theories of language contact.

There is a certain structural difference between the two sections. As the chair of Iranian languages was established several decades ago, there was already an established research tradition in this field when the present holder

of the chair got her position. Quite a number of theses have been produced over the years, and some of the present PhD students were in fact accepted by the former professor before the new regulations for research scholarships were enforced. The projects of the researchers and the PhD students deal with different aspects of Iranian languages and literatures. Since the chair of Turkic languages is new, however, there is only one PhD student in Turkic languages. The research of the professor of Iranian languages is primarily concentrated on Balochi, a language in the south east of Iran, but also includes other Iranian languages. Aspects of bilingualism constitute the main research subject of the senior lecturer in Iranian languages. The scope of research by the professor of Turkic languages is quite diversified, comprising, among others, synchronic studies of Modern Turkish, Karaim, an almost extinct Turkic language in Lithuania, and Kashkay, a small Turkic language in Iran. The research profile in Turkic languages is further enhanced by the recent employment of a post-doc research scholar, who has done important research on Nogai, a Turkic language in the Caucasus, and bilingualism in Germany, and who is now working on a project which also partly involves diachronic aspects of the copula in the Turkic languages. Besides the cooperation between scholars in these two fields there is also a comprehensive synergy with other sections. The one between Turkic languages and Computational Linguistics should be mentioned in particular.

General Linguistics

The chair in General Linguistics was established in 2001, and there are signs that the subject has not yet been fully developed. The research profile, which is quite varied, includes (1) cognitive and functional studies of lexicon, grammar and discourse from a typological and contrastive perspective; (2) the study of language development in children and adults within a multilingual context; (3) corpus building and corpus-based studies of parallel corpora and learner corpora. One important aspect is the documentation of lesser-known and endangered languages. Phonetic research is being established, including the building of a phonetics laboratory.

The combination of typological studies and studies of language acquisition, with reference to corpora, is what characterizes this section of the department. A great deal of research is going on. There have been a number of externally funded projects in recent years. A current project examines problematic areas in the acquisition of Swedish and German (Erik-Philip-Sörensen Foundation, 2007-2009). A proposal has been submitted to the Swedish Research Council for funding a Swedish FrameNet, which fits in with similar international projects for other languages. Three doctoral theses were recently completed (2006), and another four are in progress. There is thus potential for further development.

Computational Linguistics

The Computational Linguistics section builds on the long-term experience of research in computational linguistics and natural language processing at Uppsala University but enriches it with up-to-date methodology and trends. The section has a very compact profile, and the work of senior scholars is well complemented by the work of young devoted researchers. This is a reliable indication that there is a high potential within the section for future development and activities.

Altogether, our impression of the department is positive. The wide variety of languages and the emphasis on linguistic theory and method form a promising combination that is likely yield fruitful results in the future. It is a good sign that the department has many doctoral students (17) and younger members of staff.

11.3.2 Quality of research

Turkic and Iranian Languages

The research on Balochi, Karaim, and typology of the Turkic languages should be emphasized especially as being of internationally high standard. The same is true of the studies on Nogay.

General Linguistics

Much of the research done is of an internationally recognized standard. Some of the work, especially in lexicology and typology, reaches a high international standard.

Computational Linguistics

The research carried out in the section is of an exceptionally high quality, internationally well recognized, and highly appreciated. The strongest points of the research are the following: (1) automatic syntactic analysis based on a dependency approach, with a multilingual orientation; (2) advanced methodology in machine-translation research based on an integration of rule-based and statistical approaches; (3) corpus-based research on different languages and for applied purposes like machine translation, foreign language learning (e-learning), and automatic language understanding. Overall rating: top-quality, world-leading research.

11.3.3 Research environment and infrastructure

Turkic and Iranian Languages

Adequate.

General Linguistics

There is a mix of older and younger researchers, which provides a good research environment. A new psycholinguistics laboratory is needed in connection with research on speech impairment (see below).

Computational Linguistics

The staff is well balanced with respect to age, experience, and research interests. The department is interested in tracing the continuation of the career of their former students, especially the PhD students. It is also important to note that there is a spin-off company (established by the Professor of Computational Linguistics in 2006) which offers job opportunities for former students and continuation to work in the domain.

11.3.4 Networks and collaborations

Turkic and Iranian Languages

Both the Turcological and the Iranist milieu seem to have a well-established network of international contacts, and they have developed excellent possibilities for publishing their work. Uppsala scholars from both fields were represented when the large-scale project of “Turkic and Iranian contacts” with several invited specialists from abroad took place at SCASS in the academic year 2006-2007, and they follow up this international field of cooperation by participating in numerous international congresses and symposia.

General Linguistics

Members of staff are involved in networks and collaboration on a national and an international level. An important aspect is the growing cooperation with other fields, facilitated by the recent reorganization of the Faculty. There are good signs that this is being strengthened, not least in connection with the plans for a Linnaeus Grant project (see below).

Computational Linguistics

The section has built up an extensive international network of collaboration, especially in the field of corpus building and annotation, in which staff members play a leading role. The section is engaged in the European infrastructure programme CLARIN, which is a broad network including about 25 European leading centres in Computational Linguistics and corpus research.

11.3.5 Opportunities for renewal and emerging science

Turkic and Iranian Languages

Language documentation, especially when it comes to endangered languages, is an important part of the activity of both the Iranian and the Turkic scholars, and the involvement of the professor of Turcology in the establishment

of a Turkish-Swedish corpus with the cooperation of the scholars in Computational Linguistics is very promising. In this connection, we strongly recommend that the scholars of Turkic and Iranian languages together with computational linguistics benefit from the proposed Linnaeus Grant project (see below) in order to develop their corpus research further.

General Linguistics

Good opportunities for renewal and development are provided by the combination of research in general linguistics and computational linguistics with research on a range of individual languages in the department. The planned research on Specific Language Impairment in collaboration with the Department of Speech and Language Pathology at the Faculty of Medicine is a promising new area of research.

Computational Linguistics

The most promising new research direction is connected with the plans for a Linnaeus Grant project which aims at establishing a strong research environment where computational linguistics, general linguistics, and individual languages within the whole Faculty will cooperate. The proposal seems very well designed and structured, it takes advantage of the diversity of research within the Faculty and at the same time offers a common ground as well as a platform for advanced research in linguistics in a broad multilingual and social perspective, in coordination with and supported by up-to-date language technology.

11.3.6 Actions for successful development

General

We strongly support the establishment of a Faculty-wide Linnaeus Grant project, as outlined above.

Turkic and Iranian Languages

Continued cooperation between the Iranists and Turcologists is most desirable. The diversified high-quality research activities within Turcology give this section the potential of becoming one of Europe's leading centres of Turkic studies. However, in order to attain this goal, the cultural aspects of Turkic studies should be strengthened by research in Turkish or Turkic literature.

11.4 Department of Modern Languages

The department was formed out of its units as recently as January 1, 2004. Generally, the panellists have noted that very obvious opportunities for collaboration within the new department and across its borders have been realized

only very fragmentally up to now. It is highly recommendable that the units of the Department of Modern Languages become more active in this respect.

11.4.1 Unit of Slavic Studies

General assessment

The unit's only Chair retired in 2003, and a new Chair will be employed soon. At present, research is conducted in the fields of Russian, Bulgarian, in Bosnian-Croatian-Serbian linguistics as well as in Polish literature. The new Chair will focus on Russian and South Slavic linguistics.

In general, the unit is doing well, the productivity of most of its members is high or even very high. The section's focus on diachronic linguistics and philology is unique within Sweden. Its widely recognized staff members collaborate with outstanding scholars from all over the world, including specialists from Russia, Central Europe, and the US. At present, one of the staff members is a research fellow of the Royal Academy of Letters, History and Antiquities. The research areas of all staff members cover a significant segment of Slavic studies. Because of an agreement between Uppsala and Stockholm Universities a number of Slavonic languages are not actively researched.

Quality of research

Much of the research done is of an internationally recognized standard. Research on Church Slavonic translations, the translations of newspapers into Middle Russian, Russian-Swedish lexicography reaches a high international standard. Research on Polish literature shows the potential of reaching a high international standard.

Networks and collaborations

The Slavic Unit takes part in a number of networks and joint projects on an international scale. Intradepartmental collaboration should be reinforced within particularly promising fields such as 17th century studies, the study of translations and the encounter of cultures in the very broad philological and historical sense that applies to the unit itself.

Opportunities for renewal and emerging science

The new Chair should strengthen the study of Bosnian-Croatian-Serbian, which is one of the most important minority languages of Sweden. Here, perspectives of collaboration with subunits of the same department as well as across the departments should be realized and put into practice. Hopefully, the positions of retiring staff members will be filled with persons that would reinforce the highly visible strengths of the department. Albanian will be established in the unit very soon, which will be a difficult task to fulfil due to the simple fact that Albanian is no Slavic language, and it has not been studied in the unit before.

11.4.2 Unit of Finno-Ugristics (Finno-Ugrian languages and literatures)

General assessment

Traditionally, Finno-Ugristics comprises several languages/language groups within the FU language family (the total number of FU languages is around 25). In Uppsala research has constantly been done on the so-called minor FU languages spoken in Russia, and FU studies have a wide spectrum ranging also to the culture of the FU peoples. However, in research the main emphasis is on the four FU languages spoken in Sweden, namely, Saami, Finnish, Hungarian and Estonian, of which Saami and Finnish have a history of several centuries in Sweden. Apart from diachronic language research, studies have been published on bilingualism, sociolinguistics, translation studies and synchronic grammar, as well as on literature and folklore.

Most of the research within the unit is produced by individual researchers who do not seem to have much cooperation with one another or with other scholars of the department/faculty/other faculties.

The unit has a strong and internationally reputed tradition in Saami studies. The study of Estonian (especially of Swedish Estonian), on the other hand, has emerged strongly during the last few years, and will continue to do so with the funding of the Swedish Research Council.

Quality of research

Much of the research is of an internationally recognized standard. Research on Saami and Estonian and also on the minor FU languages and cultures reaches a high international standard.

Networks and collaborations

The FU unit is taking part in traditional international networks of the field, but it would seem necessary to focus more on collaboration across department and university borders.

Opportunities for renewal and emerging science

The FU section has good potential, e.g. in the study of bilingualism, sociolinguistics, language revitalization and minority languages, i.e. in a field which is of great importance in language planning and language strategy in Swedish society at the present time. The FU unit is strongly recommended to try to embark on a major project with other departments of the Faculty having similar interests. The collection of old Saami texts held at Uppsala University is unique and its study should be strengthened.

11.4.3 Unit of German

General assessment

Research within the unit is very diversified, including medieval literary studies, narratology, contrastive cultural research, second language acquisition, rhetorical analysis, historical discourse analysis, language history, phraseology, and translation research. There certainly is some overlap, but it is difficult to find some real red thread. Although the unit itself sees its diversification as a strength, with the relatively few resources available this could also turn into somewhat of a problem. The diversification could, indeed, be seen positively as a kind of profiling against general tendencies of specializing. The unit has a strong tradition in language history, which has been developing in new directions incorporating theoretical and methodological perspectives from modern linguistics. There is also some interdisciplinarity to be seen between linguistic and literary research in the unit.

The productivity in the form of articles and monographs, dissertations as well as other texts, is high in relation to the number of researchers. This also concerns the research on literature, although there is as yet no chair in German literature.

The department has been very successful in getting external financing, which can be seen as a positive indicator of quality (Wallenberg Foundation, Royal Academy of Letters).

Quality of research

Research at the department can be classified as being of internationally recognized standard.

Networks and collaborations

The unit has regular collaboration with Stockholm. International cooperation is on a personal basis.

Opportunities for renewal and emerging science

One strong general characteristic in linguistics and literary research is the contrastive perspective. Another good point is the strong tendency of interdisciplinarity between linguistic and literary research. The engagement in the new department initiative “Language and society in the 17th century” opens up new possibilities. The national Centre for the Study of German Culture and Society, which is being created, could certainly have a vitalizing effect on research in German linguistics and literature.

Actions for successful development

The unit could try a bit harder to create international networks.

11.4.4 Unit of Romance Languages

General assessment

For the present, the dominant research focus within the Romance Languages unit is on modern French linguistics. This group seems to be well positioned both on a national and an international level. Its focus on contrastive issues studied from a wide variety of angles as well as on empirical analyses combined with theoretical development brings new and innovative perspectives on French and the languages French is compared with. French literature showed significant achievements in the past ten years. However, now a renewal seems to be called for. Spanish is currently developing its research within linguistics, partly in collaboration with the French linguistics group.

Quality of research

Much of the research undertaken within Romance Languages is of an internationally recognized standard. The section is marked by a long and strong tradition within modern French linguistics, and some areas are to be singled out as being of an internationally high standard: referentiality, proper names and modality (especially epistemic expressions). A range of publications can be found in various recognized European journals and publishing houses.

Networks and collaborations

Both within literary and linguistic research there seems to be a good mix of Nordic and international (especially European) collaboration. Within literary research, there has been strong Nordic-French collaboration in the project related to French realism. In French linguistics there are currently several active research networks and collaborations at work (for example the extensive cooperation with the research laboratory MoDyCo, Paris).

Opportunities for renewal

The most obvious opportunities for strengthening the French linguistics group are the two positions obtained through the Royal Academy of Letters, History and Antiquities and the Swedish Academy. There are clear synergy possibilities between the two areas singled out as having great potential for renewal: epistemic expressions and electronic discourse. Both could be related to a broader contrastive and comparative perspective, inviting cooperation on different linguistic phenomena and with other languages - within the department or with other departments. Cooperation with the Department of Linguistics and Philology might be particularly fruitful. It is significant that French is included in the planned Linnaeus Grant project (see our report on the Department of Linguistics and Philology, C5). The proposed new project in French literature needs further specification.

Actions for successful development

The panel considers the situation and projects within French linguistics to be a unique opportunity for renewal. We recommend, however, that more offensive strategic planning be taken from the start, taking into consideration recruitment and cooperation, in order to strengthen the research environment.

11.5 Department of Scandinavian Languages

The Department of Scandinavian Languages is one of the largest departments within its field, not only in Sweden, but also in Scandinavia as a whole. The department has four chairs with partly overlapping responsibility. Basic education is an important departmental task and takes a large part of the resources (43 % of the budget) that are allocated to the department.

11.5.1 General assessment

As a whole, the department is doing well, having productive staff members with a strong urge also to fulfil the “third mission”. The average production rate is the highest within the Faculty, and the numbers document very high research productivity. The statistics include works in Swedish and English. Popular articles, books and newspaper articles are also included (in accordance with the university’s central instructions on reporting titles for OPUS), and the listing of these works documents very convincingly that the department takes the “third mission” very seriously.

The department builds on long and proud scholarly traditions, particularly in language history and comparative linguistics. This tradition was renewed and strengthened in the 1970s with sociolinguistics and text analysis. These combined traditions now form a very strong part of the identity of the department. Thus, each of the department members seems to know his or her place, what to do and how to do it. This identity, which has given the department a strong reputation, is both a strength and a weakness today. It is a strength because the department still holds a prominent position in sociolinguistics and discourse analysis of different kinds. It might be considered a threat because the department - due to its successes - runs the risk of avoiding confronting itself with potential necessary renewal.

The synergies between the different parts of the department might be strengthened. Collaboration with other departments and faculties might be intensified. The panel welcomes the Linnaeus Grant proposal in which the Scandinavian Department participates (see our report on the Department of Linguistics and Philology, C5).

The department has had a very liberal attitude when it comes to the choice of subjects for its many PhD students. It is the panel’s view that PhD recruitment should be more strategic in order to strengthen the profile of the de-

partment. Thus, individual doctoral projects should be part of more general projects run by the department.

11.5.2 Quality of research

Generally, the research is on a high level, and in certain fields the researchers may compete on an international level, e.g. in sociolinguistics and discourse analysis. The research is characterized by its focus on applied linguistics, which gives Scandinavian studies in Uppsala a unique profile.

Much of the research done is of an internationally recognized standard. Some of the research in sociolinguistics and discourse analysis reaches a high international standard.

11.5.3 Networks and collaborations

The department has a number of international links, e.g. in sociolinguistics and discourse analysis, in comprehension studies and also in interaction/communication and conversation analysis.

Within Sweden and the other Nordic countries the department takes part in different collaborative networks, both academically and in Sweden also as a partner in the educational system, having for many years been responsible for developing a test battery for educational purposes.

11.5.4 Opportunities for renewal and emerging science

During the interview, the department argued very strongly for bottom-up approaches and individually initiated and oriented research and did not seem to feel a need for strategic renewal on the departmental level. The priority of the department is clearly the individual choice of each researcher, from the PhD student to the professor. Nevertheless, there seem to be some focus areas for renewal, partly within ongoing projects, partly in a pronounced interest in studies of the new multicultural and multilingual societal situation in Sweden. This latter interest could be developed into a more comprehensive multidisciplinary research program including many other fields, across several faculties in Uppsala (and several other institutions).

11.5.5 Actions for successful development

The panel recommends the department to go on with the plans of taking part in the Linnaeus Grant project (see our report on the Linguistics and Philology, C5), and also to consider starting to plan a comprehensive research project along the lines suggested during the interview and mentioned in the paragraph above.

12. Panel 7

The panel was happy to visit the various Departments and units and learn about the research conducted at the University, the conditions under which it is conducted, the problems and opportunities. Generally speaking, we were impressed by the considerable quantity and the good quality of the research carried out, despite some rather significant problems. To these we should now like to turn, in the hope that our recommendations will help to improve conditions and allow research to flourish in the future in the oldest of Swedish universities.

The University of Uppsala has been entrusted by the government with instruction and research in a large number of languages that are important in themselves, and important in the broader context of the Humanities, although they are not and never have been the object of high student demand. Our colleagues in the relevant units are eager to carry out the “national responsibilities” conferred to them. However, there are structural obstacles to the realisation of this intent. In allotting national responsibilities to the University, the authorities apparently have not provided the necessary funding, some of which could have come from the re-allocation of resources this policy should entail. Furthermore, and this is the most difficult situation faced by the units teaching these languages, the “smaller” languages by definition do not attract large numbers of students. We understand that the funding of positions, including those of graduate students, is dependent on undergraduate enrolment. It does not seem equitable to hold the “smaller” languages to the same numerical standard as those disciplines that are naturally well populated. Since the authorities have wisely recognized that this University would render a considerable service to scholarship by continuing instruction and research in these subjects, allowance should be made for the specific needs of the fields.

Of particular importance in this connection is the recruitment of doctoral students in the small fields. The current method of assigning numbers of graduate students by reference to past numbers easily leads to a downward spiral in the small fields, and to a virtuous cycle in the large ones. A field cannot sustain itself for long if it is only allowed to recruit very small numbers of students for long periods. Over time, scholarship quite simply cannot be reproduced, let alone be rejuvenated, under such conditions. This is a very serious problem that must be addressed if the University is to retain its credibility among other institutions of similar age and standing, and compete at an international

level. It is our impression that, in the larger Departments we have evaluated, the problem does not arise or is not, at the moment, acute.

We were pleased to hear that a number of doctoral students have been given the opportunity to teach in their Departments. We hope that such opportunities might become more generally available, although students should retain the choice of making use of them or not, since in some fields or for some individuals concentrated research over four years is necessary for a good dissertation to be produced.

On another issue, it is clear that research opportunities and teaching obligations are inequitably distributed among the faculty and staff. It seems to us that both students and faculty would benefit if the research professors (Chairs) increased their teaching offerings, and, correspondingly, more research time were made available to other staff.

The SALT initiative seems to be fulfilling a need for greater contact among disciplines and Departments. The graduate students who have spoken of this with us were enthusiastic about the program, and we are glad that a number of units are participating in it. We urge that this initiative be continued. Contact and cooperation among disciplines is important. So, also, is intellectual dialogue and cooperation among units in the same Department; Departments should make an effort to promote it.

In conclusion, we have found the research carried by the units we have visited to range from very good to excellent (at international level). Some units, notably that of runology, early Scandinavian linguistics and onomastics, have already undergone a successful process of renewal. If we have to single out two other areas where development and renewal stand out, it would be Classical Philology (Greek and Latin) and Semitic Languages.

The evaluation of specific units or Departments follows in the order in which we visited them.

12.1 Department of Archaeology and Ancient History: Egyptology

12.1.1 General assessment

The staff consists of a promoted Professor, currently Lana Troy; a Junior Lecturer, Barbro Hafström, is employed half-time. The duties of the Professor consist mainly in teaching (70%), to a lesser extent of research (30%). An additional post of Senior Lecturer has been announced, and as many as twenty-seven applications from all over the world have been received, the panel is told. A decision has not yet been made. The two persons mentioned as researchers in the information sheet are actually not employed by the Egyptology unit. There are three doctoral students and eleven advanced-level students.

12.1.2 Quality of research

Research is done by the Professor, and also by the doctoral students. The output in publications consists of numerous articles and book reviews and a remarkably high number of doctoral dissertations. The unit published these five dissertations in a new series established in 2002. Electronic publication of catalogues of artifactual collections in Uppsala is also envisaged. Cooperation with the Smithsonian Institute is planned in that connection. The monographs and articles mentioned are generally of “internationally recognized”, if not high standard. Some should be considered “top quality” (e.g., Troy 1986; Engsheden 2003).

12.1.3 Research environment and infrastructure

The main activity of the unit obviously consists in lecturing for undergraduate students. The space available for the members of the unit is not ample, though sufficient. The library that includes Egyptology is situated very close to the offices. This makes for good working conditions. Much pertinent literature can be found in close proximity in the departmental building, while other books must be ordered from the Carolina Rediviva.

Members of the Egyptology unit are the only ones among those interviewed who expressed concern about their situation in the new organisational structure of the faculty. Rather than being grouped together with archaeology, some would prefer to be situated among philologists. The arguments adduced do not seem unsound, given that the focus of the teaching and the research is on the philological side of Egyptology.

12.1.4 Networks and collaboration

There is cooperation with the Archaeology unit insofar as two graduate students are engaged in the latter’s fieldwork in the Egyptian Nile Delta. It was reported that there are plans for archaeological fieldwork at the Mut temple at Karnak, Luxor, Upper Egypt, to be undertaken in cooperation with the Egyptology Institute of Johns Hopkins University, Baltimore.

12.1.5 Opportunities for renewal

The promoted professor will retire in six years’ time. The part-time lecturer will also retire soon. Given the Uppsala system that makes a strict distinction between lecturing staff and research personnel, it is highly recommended that one or more research positions in Egyptology be created. In the present circumstances, there seems a certain lack of focus as to research areas in the unit, which may be due in part to the fact that the personnel is limited in number, and therefore has to cover many different subfields.

12.2 Department of English: Celtic Studies

12.2.1 General assessment

Given the resources available the research in the department is impressive. Among various possible issues like diversity, synergies, multi- and interdisciplinary activities, outreach, demographic and gender profile, only that of multidisciplinary appears to apply, in the sense that the lecturer looks after several different languages, as well as the history and cultures of their speakers.

12.2.2 Quality of research

Dr Mícheál Ó Flaithearta's own work is considered by experts in the field as being of an internationally high standard.

12.2.3 Research environment and infrastructure

From a staffing point of view, the research environment, especially in terms of personnel composition (senior, junior, student, technical or other personnel etc.), is inadequate. On the other hand, interaction with visiting colleagues, seminar activities, etc., have been well managed. The infrastructure is apparently adequate. The panel notes that the library resources are in particularly good shape, due to having been built up over many years by successive lecturers of Celtic Studies. The current location of Celtic within the Department of English appears harmonious, but the panel suggests that other possibilities may be explored in the future, if circumstances make it advisable.

12.2.4 Networks and collaboration

Dr Ó Flaithearta is a frequent participant at international conferences on Celtic Studies and related disciplines. The panel also notes that one of his doctoral students has obtained a temporary university post, teaching Celtic Civilization in Ireland. Good use has been made, over the years, of the Erasmus and Socrates networks: Swedish students have studied in the Celtic countries and Irish students have come to Sweden.

12.2.5 Opportunities for renewal

Activities for renewal can only happen if the staffing situation changes for the better. That also applies to any assessment in terms of academic quality of ideas and plans as well as the feasibility of their realisation. We have no impressions regarding junior faculty activities.

12.2.6 Actions for successful development

Further improvement of the quality of research in the department will depend entirely on the staffing situation. The panel notes with satisfaction that a successor to Dr Ó Flaithearta is being appointed. However, it also recommends the immediate implementation of the 2003 report from the Higher Education Authority (*Utvärdering av utbildning i baltiska och keltiska språk vid Stockholms respektive Uppsala universitet*, Högskoleverkets rapportserie 2003:14 R, p. 24), according to which a Chair of Celtic ought to be established alongside the existing lectureship. It notes with approval the imminent appointment of a Visiting Professor, as an interim measure.

12.3 Department of Linguistics and Philology: Latin

12.3.1 General assessment

Research at the Latin unit has a strong diachronic profile, with an emphasis on Neo-Latin studies in the last ten years. The Swedish tradition of “Sprachwissenschaft” within Classical Philology is still represented and will probably continue to be so in the future. The editing, translating and commenting of texts also has a long tradition in Uppsala. This is very valuable. The unit has a lot of interdisciplinary cooperation both within and outside its own department (e.g. history, archaeology, history of ideas and learning, philosophy, theology). The staff participate in different international networks, such as Neo-Latin, codicology, the Linnean Society in London, etc. The chair has been vacant for less than a year and a new appointment is due for the next academic year. The gender distribution seems balanced.

12.3.2 Quality of research

The unit has a comparatively high number of externally financed projects (at present four in all), which is a sign of the generally high standards of research within the unit. The projects span from philological studies of Non-Christian inscriptions from the Roman Empire and Medieval model genres through studies of ideas on the anthropomorphic image of God to the works of Emanuel Swedenborg. This latter project consists of the making of a database, but also of creating new methods for typology within Neo-Latin studies. The fact that the funding of this project was renewed by the Swedish Research Council, something that is most unusual, is a sign of its high quality. The unit also takes part in the larger project *The Ancient Tradition*, originally a joint project of Greek and Latin but now expanded to other disciplines. This forms an extremely successful constellation within the department. All in all, the unit stands out as one fulfilling all the qualifications of internationally high standards, and in the case of Neo-Latin studies, Professor Helander is con-

sidered a world-leading researcher within the field of the Latin of Emanuel Swedenborg, scientific Neo-Latin, and Nordic Neo-Latin generally speaking.

12.3.3 Research environment and infrastructure

The unit is relatively small, with one professor and one lecturer. Five doctoral students and a number of externally financed researchers create a vital and inspiring environment in spite of the small dimensions. The possibilities for local collaboration within the new departmental structure are obviously made good use of, and there seem to be lively seminar activities both within and outside the language faculty at Uppsala, as well as with scholars from abroad. Library resources are adequate, but there is some worry about the dangers of losing reading space in the Carolina Rediviva library.

12.3.4 Networks and collaboration

There is a high degree of network participation and international collaboration, as exemplified by the fact that one of the doctoral candidates has an Oxford professor as second supervisor, and by the fact that the next International Congress of Neo-Latin Studies will take place in Uppsala in 2009.

12.3.5 Opportunities for renewal

For the last ten years there has been an average of one doctoral exam per year, and most of these doctors have found good positions in various institutions and universities. The present doctoral candidates made a very good impression on members of the panel. They seem to be energetic and have made good progress in their dissertations; they enjoy excellent supervision, and have clear visions of the long-term scope of their work.

12.3.6 Actions for successful development

The quality of research is already high. The unit should be encouraged to maintain its successful interdisciplinary collaboration both locally and internationally.

12.3.7 Other issues

The new Department of Linguistics and Philology is described as a success. The concentration of administrative resources and the synergies in the new environment have allowed the subject areas to retain a vital diversity of research interests.

12.4 Department of Linguistics and Philology: Greek and Byzantine Studies

12.4.1 General assessment

The unit, which was originally entitled “Byzantine Studies,” has enjoyed an international reputation for a long time, because of the high output and quality of its research activities conducted under the guidance of Professor Jan-Olof Rosenqvist. In terms of diversity, it must be noted that the unit is currently carrying out research and teaching in Classical Greek, Late Antique and Byzantine Greek. That, however, is the result of a reduction of the University’s commitment to Greek philology. The decision to leave the Chair of Ancient Greek vacant resulted in the number of Professors of Greek being halved: where there was a Professor of Classical Greek and one of Byzantine Greek, there is now only the latter, who carries out the duties of both. However, Classical Greek is itself a discipline essential to any major university, quite apart from the obvious fact that it forms the basis for the study of all other varieties of Greek.

Aside from this regrettable situation, the panel gained a very favorable impression of the research going on in Greek and Byzantine Studies. Cooperation and synergy within the unit appear to be exemplary. Together with their Latinist colleagues, the members of this unit have received a large grant for a project on *The Ancient Tradition*, which studies the reception and interpretation of antiquity by people of the Late Antique and Medieval periods. The project has a solid intellectual focus, and its active researchers bring their separate areas of expertise to bear on it. Both classicists and Byzantinists in the unit participate in the project. In terms of outreach, we note with approval that the Senior Lecturer, Dr Ove Strid, has, as a result of his participation in an EU-funded project on the teaching of classical languages, designed an online course in Classical Greek.

In terms of internal interdisciplinary cooperation, the project on *The Ancient Tradition* is a joint Greek and Latin project, which will doubtless also engage scholars in comparative literature. While there is no such formal collaboration with Slavists or Semitists, the panel is told that there is close contact, joint attendance of seminars and lectures, and interest in each other’s work. In general, it is noteworthy that Byzantine Studies has enjoyed an exceptionally high level of success in obtaining outside grants (approximately 75% in the years 2000-2007, without counting the *Ancient Tradition* project or a very prestigious four-year post-doctoral fellowship).

12.4.2 Quality of research

The University of Uppsala is well known internationally for its pioneering work on Byzantine hagiography, which was started by Lennart Rydén. That is an area of comparative advantage for Uppsala, which is being successfully

pursued in the research of Professor Rosenqvist and some of his graduate students. That specialization is now being supplemented by work on secular Byzantine literature, such as, for example, that of the post-doctoral fellow, Dr Ingela Nilsson, whose contribution is innovative in the Uppsala context. Competence in Ethiopian and Syrian art is also to be found in the unit. The Department's series *Byzantina Upsaliensia* is well respected in the field of Byzantine and post-Byzantine studies. In terms of the research carried out in the Byzantine field, we would rate the unit as doing "top-quality, world-leading research". The researchers, postdoctoral fellow, and graduate students with whom we spoke appear highly competent and work well as a group.

12.4.3 Research environment and infrastructure

The personnel composition is fine, with the major and very serious exception of the absence of a Chair in Classical Greek. The infrastructure, including libraries and office space for graduate students, is adequate from what we can gather.

12.4.4 Networks and collaboration

As has been stated above, the research of the Byzantine Studies group is well recognised internationally; there is the expected degree of international collaboration and presence in international meetings.

12.4.5 Opportunities for renewal

The unit is clearly renewing itself; the focus on hagiography is being supplemented with a new interest in secular literature, while the project on the reception of ancient literature is both innovative and important. Our impressions of junior faculty activities are very favorable, as stated above.

12.4.6 Actions for successful development

It is essential that the Chair of Greek be filled without delay. We were impressed by the fact that this was an urgent wish of the Latinists as well.

12.4.7 Other issues

Doctoral training is excellent.

12.5 Department of Linguistics and Philology: Indology and Comparative Indo-European Linguistics

12.5.1 General assessment

The unit and its research are in a state of transition. The former Professor retired in 2003 and the present Professor, who was appointed only in 2004, is going to retire in 2009. There had been no doctoral dissertations in the unit for a long time, but the situation is changing now. One PhD dissertation was completed in January 2007, and another one is due to be finished in 2008. The unit expects to have two doctoral students at one time. One slot is to be filled soon. The present staff consists of a Chair Professor competent in classical and modern Indology, and a Senior Lecturer competent in classical Indology (Vedic, Sanskrit, Pali) and Comparative Indo-European linguistics (including competence in Tocharian). The Senior Lecturer has a heavy load of teaching and administration, leaving little time for research. The unit is expected to get a half-time lecturer in Hindi in September 2007.

12.5.2 Quality of research

The Chair Professor, Dr William Smith, is the author of numerous books and scholarly articles. They make him a leading authority internationally in the study of medieval epic and narrative literature in the vernacular languages of eastern India (Bengali, Assamese, Oriya). The publications of the Senior Lecturer, Dr Christiane Schaefer, are constantly quoted in professional literature and her research is of very high international standard. The research constellations of the unit will naturally to a large extent depend on the research interests of the successor of the present Professor.

It should be noted that the former Professor of Indology is the editor-in-chief of the widely known journal *Orientalia Suecana*.

12.5.3 Research environment and infrastructure

The departmental setting of the unit is favorable; staff and students find it inspiring. There is a good spirit of collaboration both within the unit and within Uppsala University at large. A South Asia Seminar begun in 2006 is a first step towards a closer collaboration with other units associated with South Asian studies (Comparative Religion, Cultural Anthropology, History, Development Studies, Political Science, Musicology, etc.). It is part of the "Forum for Advanced Studies in Arts, Languages and Theology" (SALT). There is very close cooperation of the unit with the Nordic Centre in India (NCI), a consortium of leading universities and research institutions in Denmark, Finland, Norway and Sweden, which was established in 2001 with the objective to facilitate cooperation in research and higher education between the Nordic countries and India. Its main office is located at Uppsala University. The library resources

are satisfactory and there is adequate working space and other infrastructure. However, the unit is in dire need of more staff (see below).

12.5.4 Networks and collaboration

There is an official agreement of collaboration in Indology with the University of Cologne; at present this is very useful for the doctoral student working on modern Tamil, which was previously, but not currently, taught at Uppsala. The senior lecturer is actively participating in the large project of cataloguing oriental manuscripts in Germany (Katalogisierung der Orientalischen Handschriften in Deutschland).

12.5.5 Opportunities for renewal

India is fast emerging as one of the leading countries of the world both economically and politically. There is a need for Sweden to train specialists in various fields of life with an adequate knowledge of India, in addition to practical skills in other fields (economics, political science, etc.). A teaching program called “Orientalistikprogrammet” offering such training for students interested in Arabic-, Persian- and Turkish-speaking countries has been successful at the Department of Linguistics and Philology for several years and from September 2007 the South Asian unit will contribute with courses in Hindi and Indian culture and religions. At a higher level, the students of this program can choose to specialize in linguistic and philological subjects and then continue as research students in their respective language fields. The unit also intends to participate in the planned research project called *The Urban Mind*.

12.5.6 Actions for successful development

Closer collaboration with other departments within Uppsala University opens up tremendous potentialities of new scholarly research on modern (and classical) India. However, they cannot become a reality without at least a full-time Lecturer in Hindi. If the proposed new lecturer could also teach courses in Sanskrit, the present Senior Lecturer would have more time for her important research. There should be a Professor in Comparative Linguistics, who could offer important methodological support to linguistic research in a number of other units (e.g. Latin, Greek, Iranian, Slavic, etc., but also non-Indo-European languages).

Sanskrit and classical Indian culture are indispensable for understanding Hindi and modern India and Asia at large. In importance they can be compared with Greek, Latin and classical antiquity in European civilization. It is vital that teaching and research in classical Indology not suffer with the expansion of the unit’s activities towards modern studies, since it is possible that in the

foreseeable future Indology in Sweden will be represented only at Uppsala. It should be noted that Indology and Comparative Indo-European linguistics have been discontinued at Gothenburg University, without any compensating resources being added to Uppsala and Stockholm Universities. The chair in South Asian languages and cultures should be defined to combine classical and modern studies, but as broadly as possible, so that a good number of competent and dynamic scholars will apply.

12.6 Department of Linguistics and Philology: Assyriology

12.6.1 General assessment

The importance of Assyriology within the fields of history and philology seems evident, and the discipline is recognized by Sweden as a “national responsibility” to be fulfilled by Uppsala University. The program of Assyriology at Uppsala, which dates back to the beginning of the 20th century, has since his 1998 appointment as lecturer, and 2000 promotion to professor, been directed by Olof Pedersén. No further academic personnel are assigned to the unit. Given the difficulties inherent in leading, as a single scholar, a credible disciplinary program of the necessary breadth of Assyriology that includes 3000 years of written history and a myriad of languages, we believe that Professor Pedersén can be commended for his work. Since 2004 he has been funded as “Leading scholar” by the Swedish Research Council. His success in procuring external funding for his ongoing, professionally recognized research on early literacy and textual archiving has given the unit an international profile that is now attracting the interest of graduate students. They assume some of the teaching load that the unit carries in undergraduate and graduate training.

12.6.2 Quality of research

The unit’s promoted Professor Pedersén has enjoyed a remarkable level of success in procuring external funding for his internationally recognized research on archival structures in ancient Mesopotamia. The Swedish Research Council’s 2004 grant for leading researchers has enabled a long-term cooperation with the second most significant European collection of cuneiform inscriptions, that of the Vorderasiatisches Museum in Berlin. Professor Pedersén has in the past two decades worked with the curatorial staff of the Berlin museum to compile and publish a catalogue of 6000 artifacts from the major German excavations of Assur and Babylon, and the shared opinion of philological experts is that these publications are extremely useful, if not entirely innovative and, without web access, of limited accessibility to an interdisciplinary com-

munity that lies beyond the confines of specialists in the field of Assyriology. We would rank the level of research of this unit as being of an “internationally high standard.” At the same time, we note that the unit is involving itself in the highly innovative initiative *Urban Mind* that holds great promise for the exploitation of cuneiform resources in a variety of disciplinary settings (below). Dissertation topics of a set of three talented graduate students in Assyriology appear promising. They include a prosopographical analysis of mid- to late 3rd millennium archives and a treatment of the verb in epic Akkadian.

12.6.3 Research environment and infrastructure

At the personnel level, the unit consists of but one promoted professor and is therefore not an optimal configuration for fruitful research in a very broad field of studies, both chronologically and geographically. The program has access to the cluster library also available to Uppsala’s archaeological department. Professor Pedersén stated that this library has limited holdings in important Assyriological reference works, but that his students avail themselves of the resources of the Carolina Rediviva. His personal library is substantial. Office space and IT support appear to be sufficient for the day-to-day research and instructional needs of the unit.

12.6.4 Networks and collaboration

Of course Pedersén has been a strong proponent of international collaboration through his Research Council project dedicated to the cataloguing and archival interpretation of the two major cuneiform collections of the Vorderasiatisches Museum. His cooperation in the initiative *Urban Mind* intended to focus on processes of interaction among cultures from the Mediterranean area eastward promises a new interdisciplinary outreach for the field of Assyriology at Uppsala. Further, Pedersén has entered preliminary discussions with the Assyriological institute of the University of Copenhagen with an eye to expanding an already existing network of informal exchange to position Assyriology at Uppsala to participate in an institutionally grounded, if possible *formal* exchange network including both students and faculty. Oslo may emerge as a future partner in such an exchange network that would, of course, want to include the center of Assyrian studies at the University of Helsinki.

12.6.5 Opportunities for renewal

Pedersén enjoys a very close professional relationship with the curatorial staff of one of the world’s major cuneiform collections, that of the Vorderasiatisches Museum in Berlin, and has through his successful Research Council submissions secured funding for ongoing research on the makeup and historical content of its specific text-artifacts from the German excavations of Babylon

and Assur. This material will in due course form the basis for a major new online database of archivally ordered primary cuneiform source material.

Pedersén is, moreover, pursuing new possibilities for research cooperation across faculties and disciplines within the Humanities through his participation, as the member of DLP responsible for the coordination of the program, in the planned *Urban Mind* project. The grouping of specialists in past and modern societies, languages and religions from the Middle East, the Eastern Mediterranean basin and Northern Africa, is unique in Sweden. The eastern Mediterranean, Middle East and Indian Ocean rim can be considered more central in the Old World than western Europe, and their cultural developments have greatly influenced the world over the millennia and continue to do so today. This long-term (10-20 year) program is designed to provide a framework for scholars at Uppsala University who deal with the ancient and modern Near East and surrounding areas with common networks, seminars, and research groups with different but related themes. Assyriological research within the program will form a vital tool to enhance the impact of the unit on the Uppsala campus, and beyond its confines.

12.6.6 Actions for successful development

We frankly do not see how the expressed intention to secure the discipline of Assyriology at Uppsala as a “national responsibility” can be honored without consideration of one more staff position, preferably with expertise in Sumerian and in social-economic history. This position could be entered at either the level of Chair Professor or of Senior Lecturer. Alternatively, the University should assist the unit’s professor in formalizing a network of faculty and student exchange with Copenhagen and Helsinki to assure a broad coverage of subjects within the discipline. Further, we see the need to attract more student participation in the unit.

12.7 Department of Linguistics and Philology: Semitic Languages

12.7.1 General assessment

The Semitic unit, which comprises teaching and research mainly in Classical and Modern Standard Arabic, modern Arabic dialects, Biblical Hebrew, Syriac, and (on occasion) Classical Ethiopic (Ge’ez), is impressive in terms of both scholarly breadth and depth. The staff consists of one (chair) professor of Semitic languages (Bo Isaksson), one associate professor of Arabic (Gail Ramsay), one associate professor of Semitic languages (Mats Eskhult), and one senior lecturer in Semitic languages (Anette Månsson), who is also the head of the department. In addition, the unit has managed to attract eight ac-

tive researchers, covering areas from the influence of Israeli Hebrew on the style in Arabic newspapers published in Israel (Torkel Lindquist) and Arabic dialectology of the Gulf States (Maria Persson) to modern literary theory applied to Arabic (Astrid Ottosson al-Bitar), just to mention three examples.

The current research projects of the active staff cover a vast array of topics, ranging from grammatical issues such as circumstantial qualifiers in Semitic to modern literature in the Gulf States, discourse analysis of Arabic TV programs (al-Jazeera), and religious imagery and tradition in modern Palestinian and Israeli Hebrew literature (Anette Månsson).

The unit currently hosts five PhD students, whose research topics include both linguistic and literary issues in Biblical Hebrew and Classical Arabic; one student investigates Arabic cognates in Eastern Neo-Aramaic (Turoyo).

The present overall structure of the unit is excellent. It is intellectually important to continue the practice of teaching and conducting research in several Semitic languages under the umbrella of philology and linguistics as is currently the case at the University of Uppsala.

12.7.2 Quality of research

Generally speaking, the quality of research carried out in the unit can be characterized as being of an “internationally high” standard. Some recent publications, notably Anette Månsson’s dissertation on the Palestinian author Mahmoud Darwish, are truly excellent. In general, the quality and the interesting topics of the dissertations supervised in the unit have to be commended.

The same holds for the ongoing and planned projects, all of which are of interest not only from an academic perspective but also from a more general outreach perspective.

Members of the staff edit the important monograph series *Studia Semitica Upsaliensia* and participate in the editing of the widely recognized journal *Orientalia Suecana*.

12.7.3 Research environment and infrastructure

The interviewed staff and PhD students appear to be generally satisfied with the research environment (space, library situation). Given the strong and ongoing interest in Arabic, the unit recommends the appointment of a permanent lecturer of Arabic (native speaker). This would help the Arabists in the unit to balance their teaching and research responsibilities. On occasion, graduate students get an opportunity to take part in teaching, which they appreciate. The unit has successfully integrated guest lecturers (e.g., Emanuel Tov from the Hebrew University of Jerusalem) in its teaching program.

The unit has had success in attracting funding from external sources, notably the Swedish Research Council.

12.7.4 Networks and collaboration

The number of international scholars from European countries, Israel, and the USA who visited the unit in the past twelve months alone is impressive. Staff and students in the unit regularly give papers at both Scandinavian and more broadly international conferences. In 2005, the unit organized a highly successful international meeting at Uppsala on the occasion of the 400th anniversary of Semitic Studies at Uppsala University. In 2008, it will host the Eighth EURAMAL (European Association for Modern Arabic Literature) colloquium.

12.7.5 Opportunities for renewal

As of now, the research activities in the unit are characterized by both traditional philological methods and modern innovative approaches to subject matter, notably in the realm of discourse analysis in modern Semitic languages. This positive situation can further be supported with the hiring of native speakers as lecturers in both Arabic and Hebrew.

As stated above, the research activities of the junior faculty are highly impressive and deserve all the support they can get.

12.7.6 Actions for successful development

Hiring a full-time lecturer in Arabic will greatly enhance the overall situation in the unit. Given that (introductory) Biblical Hebrew is also being taught at the Faculty of Theology, one might also envisage the hiring of a lecturer in Rabbinical and Israeli Hebrew. The unit should also ensure that in the future students continue to have the opportunity to study Akkadian.

In view of the complex logistical challenges in the unit (PhD programs, international contacts), a wish for increased administrative support was expressed.

12.7.7 Other issues

We have an excellent impression of the training of doctoral candidates at the unit.

12.8 Department of Scandinavian Languages: Runology, Early Scandinavian Languages and Onomastics

12.8.1 General assessment

The Department of Scandinavian Languages is a large department teaching all the Nordic languages. It has two research units, the Unit for Advanced Studies in Modern Swedish (FUMS) and the Seminar for Scandinavian Onomastics. The panel had a meeting with representatives from the fields of early Scandinavian languages (including Old Norse), runology and onomastics. While the latter covers names from the earliest times to the present, the other fields work with sources from the time before the reformation. Research and teaching in these, primarily historical fields are covered by three professors (of whom two hold chairs), two senior lecturers and one junior lecturer. Occasionally, other researchers at the department contribute to onomastic and historical research. No less than five retired scholars, now in their seventies or eighties, are still very active. They hold posts as editors of several periodicals hosted by the department, and they also publish regularly. At present, there are twelve doctoral students.

As a whole, the onomastic and historical team of the department comes across as well balanced, thriving and focused. There is an efficient division of labour, especially between the onomastic staff and the rest of the department. The fact that the onomastic seminar is located in another building does not appear to be a problem. There is smooth cooperation among staff members in various constellations and in a number of subjects. The research carried out is diverse and the staff find this to be a strength. They keep in close contact with colleagues at other departments, both in Uppsala and at other universities. In fact, the panel finds it difficult to point to any apparent weaknesses in the onomastic and historical team of the department. Outreach activities are highly commendable. Numerous articles are published in popular journals and books, and there is frequent contact with local interest groups. Some publications, such as the lexicon on place names, have reached a broad audience.

The staff is predominantly male; at present, seven of the twelve doctoral students are female. The number of completed doctoral dissertations is high.

12.8.2 Quality of research

The research in onomastics, runology and early Nordic languages is highly respected, in Sweden and abroad. The staff publishes very broadly and edits an impressive number of periodicals, e.g. *Namn och Bygd*, *Studia Anthroponymica Scandinavica*, *Runrön* and *Scripta Islandica*. Several of these are the leading publication channels in their fields. It should be noted that the group of unusually active retired scholars make a great contribution to the running of these periodicals. The department also maintains a database of all

known (around 6000) runic inscriptions. There can be no doubt that the research on the whole is of a very high standard. It is difficult to assess the research on a fully international level, since much of the work is carried out in rather specialised fields with a moderate number of specialists, and since the publications to a large extent are in Swedish (which is a necessity, given the national importance of the subject and the strong tradition of outreach). Nevertheless, the panel believes that the research on the whole should be classified as top-quality”, i.e. the highest of the four grades specified for the evaluation.

12.8.3 Research environment and infrastructure

The personnel composition is fine and staff members seem to complement each other in a fruitful way. The premises appear to be adequate, with sufficient office space also for the doctoral students (much improved over the last ten years, the panel was told). The Karin Boye Library located in the same building seems to function well. The library at the onomastic section was characterised as outstanding.

12.8.4 Networks and collaboration

Staff members participate in a number of networks, and collaborate actively with other institutions. Doctoral students have sufficient funding to go abroad on conferences. In the prestigious handbook *The Nordic Languages*, recently published by de Gruyter in Berlin, which documents the state of current research in Nordic linguistics, staff members are well represented.

12.8.5 Opportunities for renewal

As stated above, research at the onomastic and historical part of the department seems to be well balanced and diverse in its approach. In the opinion of the panel, there is no need to change the direction of research.

12.8.6 Actions for successful development

The panel supports the aim of the staff to bridge the gap between the East and West Nordic languages, establishing a more pan-Nordic perspective on language and, if possible, on literature (e.g. laws and charters), thereby enhancing Uppsala’s already leading position in early Nordic philology in Sweden.

The panel also notes that the Department intends to establish even closer contacts with the University Library in Uppsala, and with the Royal Library in Stockholm, which, together with Uppsala, holds a collection of Old Norse manuscripts that is moderate in size but outstanding in quality. This is a rich repository for future philological research.

The panel recommends that the *Samnordisk runtextdatabas* be further developed so that it realises the full potential of the web, for instance by adding transcriptions in Unicode compliant Runic fonts and digital images of the runic inscriptions.

12.8.7 Other issues

As mentioned above, the onomastic and the historical parts of the Department publish a very large and impressive number of periodicals. Even if there does not seem to be an immediate need to rethink the publication policy, it might be advisable to look for cooperation with other institutions in Sweden. The panel would like to point out that changing to electronic publication probably will not reduce anything other than the actual printing costs; the editorial work and quality control remain essentially the same.

The doctoral students came across as active and reported favorably on the quality of supervision, infrastructure and general ambience at the Department.

13. Panel 8

13.1 General Observations and Recommendations of Panel 8

The research in the departments and sections that the panel has visited is generally of international standard and in some areas even high international standard. The panel considers the activities for public outreach highly satisfactory.

It is a general problem that the teaching staff does not have sufficient time for research. In most of the units that the panel has visited from 50 to 75 % of the research is actually performed by PhD students. For society in general the investment in university research would become more profitable if the highly qualified and experienced academic staff had more time for research. The career system should be developed. The double career tracks, especially the positions primarily for teaching should be reconsidered and the permanent academic staff should have more time for research.

The panel thinks it has identified a systemic error common to many of the units it visited. The problem thus would have to be addressed on a level above departments. Uppsala University produces a wealth of good research of international appeal and significance but to the extent it is published in Swedish only it is of limited access.

It is no doubt imperative to keep the national language in constant use in academic writing, to ensure a state-of-the-art level for Swedish terminology in the disciplines involved. But a great deal of scholarly and scientific findings needs to reach the larger international scholarly community. Reasons for this cut both ways, i.e., they demand controllability and they demand diffusion. It seems to the panel that parts of Uppsala University have not adopted concerted measures to ensure or even encourage the use of more widely spread languages in presenting its scholarship to the world. Procedures for stimulating publication in non-Swedish languages seem to vary from unit to unit.

The panel recommends that the following suggestions are taken into consideration

- The academic staff should be encouraged and supported by the faculties in efforts to publish in high impact international journals, periodicals and books by high level international publishers.
- PhD students should be strongly encouraged and supported to visit foreign universities as part of their training.
- The PhD students should open their studies with an advanced introduction to academic life and academic writing. The information of

the PhD students of their training possibilities on a national and international level should be improved. The conditions of supervision should be described in a more formal and systematic way.

- The SALT program (Forum for Advanced Studies. Art, Languages, Theology) should be prolonged.
- The faculties should implement a highly skilled and experienced service function for academic staff working with international research applications to give advice on funding strategies and practices.
- The faculties should make it easier for the academic staff to overview on-going research projects of the university and find projects that are related (e.g. gender studies or medieval studies).

13.2 The Centre for Gender Research

13.2.1 General assessment

The Centre for Gender Research was established in its current form in 2003. The university outlined the teaching and research activities of the centre stating that both “should include social as well as biological perspectives on gender”. The centre aims to function as an interdisciplinary and cross-disciplinary node for gender research and teaching within the University of Uppsala. It has connections and cooperation across the university, funding from all nine faculties, and representation of all faculties on the board. The centre does not currently have a doctoral program of its own but several PhD students from other departments with gender-related topics are linked to the centre. Joint doctoral program with Stockholm university gender studies is possible in the future. The research profile of the centre is broad and diverse. The centre has a strong tradition in interdisciplinary cultural studies. In the coming years an increasing emphasis will be on research on gender and science, more specifically on nature/culture boundaries and transgressive encounters, made possible by the Center of Gender Excellence funding from the Swedish Research Council for 5 years, started in January 2007. A key future challenge will be the double mission: the centre should strengthen its international research profile in the research field gender and science, on the one hand, but also continue to play an active role inside the university as an interdisciplinary gender research and teaching forum. On-going work on theory of gender research will serve both missions. In general, the prospects of the centre for developing to a strong research base appear positive. The centre has been successful in obtaining external national funding which enables systematic, strategic and dynamic development of research as well as hiring of new research staff both from Sweden and abroad. However, the balance between permanent and fixed-term academic staff needs to be considered.

13.2.2 Quality of research

Research conducted in the centre is of international standard and some of the scholars have recently been awarded national scientific awards. The research topics are of international interest and high relevance both scientifically and from societal perspective. Researchers and PhD students present actively their results in national and international conferences. However, the publication profile of the centre needs reconsidering. Currently too much is published only in Swedish. It is obviously important to publish results of gender studies in the national language in order to develop the terminology of the field and to disseminate research results in media and broader society. But in order to reach the goal of the centre, to develop to an internationally leading research centre, it is essential to internationalize the publishing profile, create a more ambitious publishing strategy and target leading international journals in gender studies and social studies of science and technology as well as international publishers. This is recognized in the centre and first steps to address the issue have been taken.

13.2.3 Research environment and infrastructure

According to comments from both junior and senior staff, the centre is a dynamic, supportive and very good work and research environment. It has been successful in attracting visiting researchers from other units in Uppsala and from elsewhere. The permanent academic staff of the centre consists of only three university lecturers and a director (50%). Rest of the research staff is in principle hired for relatively short fixed-term, typically one year. The new opportunities opened by the excellence program make targeted hiring possible but no long-term appointments are currently planned. The panel thinks that the current staff composition may not be ideal since it seems not to be stable enough to build a strong international research base. Permanent postdoctoral academic staff should be increased and longer term fixed-term senior positions, for 3-5 years, should be established in order to create more continuity and stability.

13.2.4 Networks and collaborations

The centre has institutional collaboration with Universities of Gent and Groningen and St. Petersburg, Russia, and is involved in the European women's studies co-operation through the European association AOIFE. It also has good connections with gender research units in Sweden and many connections to units elsewhere in the Nordic countries. Individual researchers have broad personal networks in Nordic countries and internationally. The new excellence initiative demands more targeted and effective international networking. The international advisory group for the excellence program planned to be set up is of key importance in promoting the international

visibility of the centre but also in creating international collaboration around the excellence initiative topics. It is very positive that there appears to be adequate travel funding for the staff to participate in international conferences and other activities.

13.2.5 Opportunities for renewal and emerging science

The opportunities for renewal appear excellent. The role of an interdisciplinary meeting point facilitates unexpected fruitful encounters and encourages to new collaborations and scientific interaction across disciplinary boundaries. This will most likely lead towards creating interdisciplinary research projects and consortia. The new excellence funding creates favorable opportunities for renewal and emerging science, enabling targeted hiring of PhD students and postdoctoral researchers, inviting international top level visitors, internationalizing the recruitment base and integrating cross-cultural research approaches. The panel recognizes that one obvious possible opportunity for future research collaboration inside the University is the interdisciplinary Science and Technology research centre established in Uppsala in 2004.

13.2.6 Actions for successful development

The centre has been successful in raising funds for long-term concentrated research from the national gender and excellence program. Activities to create university overarching activities, such as the open gender studies seminar, have also been positively received within the university community.

13.2.7 Other issues

The centre could strengthen even more its role and profile as a node of gender research in Uppsala University. This would benefit not only research conditions in the centre but gender research more broadly in the University. Currently gender research is conducted in numerous departments and units in Uppsala, which means there would be excellent intra-university opportunities for building interdisciplinary research co-operation, applying joint funding etc. However, the site visits of panel 8 indicated that information on on-going gender research and expertise is not always easily available across the University. The centre could adopt a more active role here by collecting and making available a continuously updated database of on-going gender research and gender expertise in Uppsala University.

13.3 Section for Textile Studies

13.3.1 General assessment

The first professor's chair in textiles was established at Uppsala University in 1998. The research personnel of the department consists of seven PhD students and one part time promoted and chair professor (Margareta Nockert). The associate professor (Mariana Eriksson) who is mentioned in the self-evaluation is not any longer at the section. The section is going to be moved from the Faculty of Social Sciences to the Faculty of History and Philosophy. The academic staff hopes that this new arrangement will improve the opportunities to develop the research of the section. The section for textile studies is unique and has attracted external funding (e.g. Swedish Research Council, Riksbankens jubileumsfond, Agnes Geijers fond). There are not many other university institutions, national or international, to which it can be compared. International research comities as Centre International d'Etudes des Textiles Anciens are very interested in the research of the section and the professor as well as the PhD students have many international contacts. Their research is followed with great interest by museums in many countries. The present professor retires in two years and a long time planning of the development of the section is needed.

13.3.2 Quality of research

The quality of the section's research is of international standard and the empirical material present in Uppsala is unique and world famous. The researchers have developed a highly qualified interdisciplinary approach. They especially stress the importance of the technical aspects of their research. Knowledge in textile craft is a necessary tool for understanding the material and thus the education and research in the practical education of craft play an important part within the theoretical field of textile research.

13.3.3 Research environment and infrastructure

The section is very small but deserves to be highlighted as a "golden nugget" of the faculty. When the section is moved to the Faculty of History and Philosophy is it important that the section does not disappear in the department for History of Arts. The faculty should try to promote a synergy between the art historians and the textile researchers. The art historians as well as the textile researchers are very positive toward collaboration and this positive approach should be supported by the faculty.

13.3.4 Networks and collaborations

The section is engaged in various international networks and tries to get more publications in international journals. The section needs support in its efforts to strengthen the international profile and the international publishing strategy. The PhD students need funding for their participating in international conferences.

13.3.5 Opportunities for renewal and emerging science

The section has talented young researchers and their work is unique. But the section needs more permanent academic staff in the nearest future and a focus on the possible synergy with department for History of Arts.

13.3.6 Actions for a successful development

The panel recommends that the section continues as a special research unit. The faculty is recommended to create a fulltime professorship for the textile section and open opportunities for the young talented researchers at the section to develop their work. The academic staff is very enthusiastic but in need of funding for international activities and a long term planning of the development of the section.

13.4 Department of Art history

13.4.1 General assessment

The general impressions of the research at the Institute of Art history are good. The research is active and diversified. Within two years, since the appointment of the new chair the department has specified its main profiles of research: medieval studies, urban studies and visual culture studies. The department is well aware of the nature of the contemporary research, stressing the need for multi- and interdisciplinarity. There exists a long tradition in the department of emphasising the social dimension of art and architecture, still relevant from the point of view of contemporary theoretical approach.

The chair professor and two members of the staff have an internationally recognised reputation in the field of medieval art history and perspective of strengthening research in that area is good. The field of research that the department lately has put strong emphasis on - studies in visual culture in connection to the urban and public sphere - is very promising and there exists academic potential for evolving this research area. The department's research interest toward Swedish as well as European art history, and art theory is highly welcomed.

13.4.2 Quality of research

The competence at the department in the field of medieval art studies is the strongest and meets an international level. Despite that Jan von Bonsdorff, Carina Jacobsson and Eva Lindquist Sandgren are working with the different subjects this may lead to the successful constellations. Within a short time the department of textile studies with its internationally respected and high quality research will join the dept. of Art history. It will strengthen the field of medieval studies and hopefully lead to synergetic effect.

Other directions of research have found its international scholarly communities that has been confirmed by the participation at international conferences and publishing activities. The content of doctoral theses is well conceptualized and follows international theoretical and methodological strategies.

13.4.3 Research environment and infrastructure

In terms of enthusiasm of the staff and PhD students the research environment of the department of Art history makes a good impression. However, a disturbing fact is that 2/3 of research is done by PhD students and senior staff is lacking the time for research. Further on, the number of PhD students has drastically decreased and has become critical. In the department there is only one chair and this, too, is influencing research capability as well as collaborative activities.

The department has fruitful research contacts with other disciplines of University of Uppsala, for example gender studies and literature studies. The currently running seminar "Nature imagined" is multidisciplinary designed and this kind of activity within the SALT-programme should definitely be further developed. The more elaborated cooperation, particularly with aesthetic and theology specialities, could be considered.

13.4.4 Networks and collaborations

The department has a good collaboration with the National Museum and the Museum of Modern Art, both in Stockholm. The research cooperation is planned and the search for funding is in process.

There is some collaboration with the dept. of Art history of Stockholm University, Swedish Institute for Studies in Education and the Nordic Network for the History and Aesthetics of Photography.

Beside personal research networking the collaboration with sister-institutions outside Sweden and international networks could be more consciously planned and elaborated. The recent activity of inviting guest researches to the department is a positive step toward establishing more stable contacts with international scholars and institutions they represent. The participation at international conferences last years shows a growing number and will hopefully contribute to the development of international networking.

13.4.5 Opportunities for renewal and emerging science

The renewal of research is already taking place. The department has specified its main research directions that include such innovative fields of research as public space, social visual identities, visual culture studies, artistic practices and roles. The stressing on more general issues as “art and society”, “art and ideology” and “art and identity” is leading to the very promising cross-periodical studies. Two pillars of contemporary art historical research - good knowledge of the material and the interpretation of it within the contemporary theoretical framework - are highly valued.

The actions taken by the department of Art history for the further development of the research are in progress: the chair has initiated the multidisciplinary project “Culture, creativity, copyright”. There are ongoing projects on Scriptorium of Vadstena nunnery (based on the collection of University of Uppsala), on the “The female convent - cultural spaces and gender politics” and on the 18th century Swedish architect J. E. Rehn.

13.4.6 Actions for successful development

The department is in need of more academic capacity to be able to realize its ambitious research goals. Particularly the increase of junior faculty number as well as the number of PhD students is suggested.

In order to strengthen the department’s position the initiation of more cross-disciplinary research projects within the University of Uppsala could be considered. The department also has a good academic platform to become a centre of research in medieval art of the Baltic sea region.

In order to raise the domestic and international visibility of the department, collaboration and networking at institutional level is suggested. A more conscious publishing strategy needs to be worked out, emphasising in publishing in international languages, particularly in the areas where the department is strong.

13.5 Department of Literature

13.5.1 General assessment

The department’s spread of research interests is impressive, as is the volume of its published output. This was to be expected from a large staff centered on PhD degree holders. The department does however seem slightly hesitant to define itself very actively along lines that would render its research profile more visible to the outside world. Projects are funded and carried out on an individual basis and the totality of the work done amounts, broadly put, to the sum of its parts. This sum is considerable but we think that if parts designed differently were added, the sum might be even larger.

We strongly suggest that the department moves more proactively, in mapping projects and in its search for funding, in the direction of projects (including doctoral projects) involving several individual researchers. This as present seems to be more of an exception at the Uppsala department. We advocate a move from loosely knit ad hoc groups to teams functioning under a project heading, one that provides them with a common problematic distinct enough to foster a research climate. The literature department is doubtlessly a rich intellectual environment. This environment, we think, would benefit from structurally discernible efforts in the shape of projects with a time-span, a start and a foreseen completion. Projects of this kind tend to add energies of their own to a department's research atmosphere. Every hardworking department has the right and the need to rejoice in seeing work come to completion every now and then. Projects above the individual level are a necessary complement to doctoral theses in this respect.

13.5.2 Quality of Research. Opportunities

The department's dual character as both a major Swedish literature research unit and a comparative literature unit is visible in its output. The department's two areas with special rubrics, sociology of literature and rhetoric, are valuable additions to its profile and we hope that the latter will be given a chance to a chair to stabilize this area as a research field at Uppsala. This could create quite a few possibilities of renewal at the department, and enhance its force of attraction to external scholars, as rhetoric is nowhere else in Sweden so closely studied in connection to literature (and to theory of literature) as in Uppsala.

Among other areas of emphasis we wish to mention pre-1850 Swedish literature, with a strong emphasis on the late 18th century and the Romantic period. This sector has attracted young scholars of promise; it is represented in the research repertoire in quite varied ways; and it is a field where Uppsala is noticeably and increasingly prominent, doing work that meets a high international standard. The department is organizing the *Uppsala Interdisciplinary Seminar in Eighteenth-Century Studies* and this initiative seems to be very valuable on a national as well as an international level.

Finally, it should be possible to strengthen the interdisciplinary efforts in the studies of the interaction between literature, religion and *Lebensanschauungs* which are being made in collaboration with other departments in and outside of the faculty, such as history, theology, or aesthetics.

These highlights give no exhaustive description of the department's strengths, which are geared to the presence of senior scholars. We therefore find it imperative that the chair coming up for replacement in a couple of years will indeed be filled.

13.5.3 Networks and collaborations

The department is amply resourced for networking and for international and national liaisons. It could certainly try harder, though, in order to attract foreign scholars to its research environment. Conversely, we have the impression that the department could be more active in encouraging their PhD students to spend some time abroad.

On the local level, there seems to be a good number of one-off ad hoc events (seminars, conferences, symposia) as a result of interaction with other departments within the faculty. Nevertheless we discern a lack of consistent collaboration with the language departments, where literary studies are an important part of the research being done, both on the PhD and the post.doc levels.

Moreover, it is important to consolidate the present efforts to arrange courses and seminars together with other literary departments on a national level. Such interaction is also important in order to maintain the quality of PhD research, threatened by the (possibly) diminishing number of faculty funded positions.

13.6 Department for Musicology

13.6.1 General assessment

The Department of Musicology is the oldest institution of its kind in Sweden and it holds a broad profile of research within musicology stretching from the Middle Ages to the role of music in a globalized world. The department puts special emphasis on historical awareness and reflexivity, while it at the same time upholds a dedication to researching music in a contemporary perspective, thus following leading international levels of theoretical and methodological concerns.

Presently the department is in the middle of a considerate change as a shift of staff is taking place. A position as full professor of music history is in the process of being filled and also a research assistant is to be announced in the very near future. This means that a process of transmission is dominating the situation of the department, and accordingly aspects of the exact strategically planning are at the moment unsettled. Further, the present PhD students are to finish their work this autumn, and no new PhD students are appointed.

However, it is clear that the research at the department is of international standard. Alongside the traditional and well established dedication to medieval studies, research is particularly strong on 17th century music, while the collected work of doctoral students and researchers show a most promising focus point on 20th century art, popular and tradition-based music.

The department claims a special dedication to Western music history and to Swedish music in particular. This is however a matter which could need

some rethinking, and a reflection on how to define and justify an insistence on Swedish Music history is highly welcomed.

Another important point of interest to the locating of a profile for the department is the balance between a historiographically informed occupation with the musical material and sources and the inherent interdisciplinarity of musicology, in which references and considerations to both philological, linguistic, and context related aspects are readily applied. As soon as the new members of staff are in their seats, the department should forcefully implement structures in which to clarify and pronounce their research profile.

13.6.2 Quality of research

The work on the Düben Collection, in which a unique, Swedish based collection of European 17th century music through the use of computer-techniques is made accessible to a wide range of researchers, is of high international standard and the panel finds that this activity could become a growing centre of a very fruitful cooperation between scholars. It is estimated that further support for the work - both in relation to finances and human resources - could make the department at Uppsala a focal point for the international community of 17th century musicologists and attract global visibility. Making the collection a centre for musicological research could also through the set up of for instance annual events in the form of international conferences or seminars at the same time neutralize the side effect of data-base archives, e.g. that travel and resulting scholarly exchange is minimized.

13.6.3 Research environment and infrastructure

The research environment is at the moment relatively small, but due to the inclusion of the 'teacher education' in the obligations of the Department it is expected that the staff can be augmented by either two post.doc fellows (forskarassistenten) or four new PhD students. This could indeed make a good contribution to the environment, and it is recommended that this increase should also open up to hosting visiting scholars when possible.

The seminars, which are at the moment suspended due to the closing up of the present PhD projects, should as soon as possible be revived in order both to develop platforms for discussions and meetings between the teachers and the students in the department and to invite cooperation with national and international colleagues and departments.

In relation to the strategy for publishing of the research, it is evident that the department has a rather good possibility for distributing their work both nationally and internationally. Many publications are in major international languages, and at the same time the researchers of the department share their result with the public through contributions in Swedish to popular media such

as magazines, booklets, radio and lectures. This double strategy should be continued in order to fulfil the so called third task.

13.6.4 Networks and collaborations

The individual members of the department engage in numerous relevant networks and collaborations with fellow researchers in their field. The cooperation is primarily internationally oriented, and often provides the platform for applications for financial support for minor research projects. It is the suggestion of the panel that more emphasis should be put on both transforming these networks to more structured forms and that they should also encompass networks with related local sister-institutions and other related fields in Sweden or Uppsala in order to strengthen interdisciplinary collaboration.

The strongest collaboration is presently with the University of Rochester in the form of the work on the Düben collection, while the involvement with the medieval scholars from a variety of disciplines are carried out in continued collaboration within established networks.

13.6.5 Opportunities for renewal and emerging science

The department has as of yet no distinct plan for further renewal but it is obvious to the panel that 20th century music research should be given attention and is in fact given attention.

The cultural studies inspired examination of technological transmitters like phonographs and recently the internet is an important aspect of any musicological study today and its presence here testifies to the strength of the department. The PhD students working on these issues have already developed interdisciplinary contacts with other centres and department, but it is obvious that the quality of the emerging work in this field benefits strongly from the historiographic orientation of the department. As such it is desirable that the work on medialization, popular music cultures and ethnomusicology are continued along these lines.

13.6.6 Other issues

As the staff is about to be augmented, it is estimated that the possibility for increasing the international impact of the department further is at hand. It would however be desired that some more attention is given to the supervision and counselling of the PhD students and that an institutionalized doctoral training providing both scholarly and formal support for their study is considered. The present informal and somewhat casual structure of the department - pleasant and productive as it is - tend to leave the PhD students in a slightly uncertain situation in relation to their programs. Finally, it would also be advised that

foreign students should be attracted in order to further enhance the international exchange.

13.7 Department of Philosophy

13.7.1 General assessment

Department of Philosophy is a research oriented institute having 2 professors, 2 promoted professors, 7 docents or other post doc researchers and 6 PhD students (September 2006). There are also associated docents with an external funding (Burman stipend) and one active retired professor from U.S.A. The researchers are divided into five research groups as follows: (1) Philosophy of language, (2) History of philosophy, (3) Philosophy of science, (4) Practical philosophy and (5) Aesthetic. The research is largely influenced by the Anglo-American analytic tradition. General features of the research are concentration on central philosophical issues, ambitious international publishing policy, extensive international research networks with joint research and publication projects, interest in interdisciplinary research co-operation (physics, linguistics, cultural anthropology, gender studies, Uppsala STS centre) and considerable activity in seeking funding for research projects. Some researchers have published introductory works and textbooks in Swedish and some have participated in public discussions in the media.

13.7.2 Quality of research

The research is of high international quality. In the self-description of the department, the groups (2) and (4) are mentioned as particularly successful. Professors Lilli Alanen (2) and Erik Carlson (4) have published a great number of articles and chapters in books in 2003-6, many of these in highly ranked international journals or series. Alanen has also published an extensive monograph on Descartes's philosophy on mind and co-edited a volume on feminist perspectives on the history of philosophy, both in first class philosophy publishers. She is one of the leading international researchers of early modern philosophy; Professor Carlson is an internationally known expert of the foundations of practical and moral reasoning. Other members of these groups have also published some studies in very good international publications and more in other places. Over the last 12 years 13 doctoral studies are produced in these groups; many of these young scholars have had a successful academic career thereafter, some of them outside Sweden.

While the groups (1), (3) and (5) have not been as active as (2) and (4) in international publishing, each of these have some English articles of high international quality as well as various Swedish publications. Lars-Göran Johansson's monograph on interpreting quantum mechanics is forthcoming in 2007. These groups have also produced several dissertations many authors of

which are docents. New projects on the philosophy of physics and on Wittgenstein are recently initiated by (1) and (3).

13.7.3 Research environment, networks and collaboration

The department provides a very good research environment with adequate facilities and has an extensive international collaboration network. Henrik Lagerlund (2, until 2006) is one of the two managing editors of the new Springer series on the history of philosophy of mind and an editor or co-editor of three international collections of essays on medieval and early modern philosophy. All these have grown out of international meetings at Uppsala as well as the work co-edited by Lilli Alanen. These meetings are part of the international research network of the group 2, which also involves established research co-operation with history of philosophy groups in the U.S.A., Canada and Nordic countries and central roles in the European Science Foundation program *From Natural Philosophy to Science* and two Scandinavian Nos-H networks of the history of philosophy. Philosophy of Language group (1) has close research contact with the departments of philosophy at the universities of Åbo, Bergen and Chicago and has also been active in two Nordic network projects; the ongoing one is the NordForsk project Nordic Network for Wittgenstein Research. The Aesthetics group has been active in various Nordic institutions of aesthetics. The department has an extensive international visitors program. These co-operative activities have added to the international visibility of the department, and the Scandinavian networks have also offered an opportunity for younger researchers and PhD students to present their results to an international audience.

13.7.4 Opportunities for renewal and emerging science

In the self-description, the most promising future research directions are said to be the projects (1) Understanding Agency: Conceptions of Action, Human Nature and Value in the Western Tradition. This plan involves 20 researchers from Uppsala and other institutions in Sweden, working in different fields of philosophy. (2) Questions of Continuity in Wittgenstein's Thought, which is associated with the theme of the Nordic Wittgenstein project and continues the Wittgenstein studies in Uppsala. (3) Philosophical Aspects of String Theory. While these are based on the strong sides of the department, some additional new orientation might be philosophically fruitful.

The themes of many ongoing PhD studies are associated with the philosophy of mind or philosophical psychology. During the department visit, the philosophy of mind was mentioned as the area in which a new position would be very helpful.

Investigating philosophical traditions in various cultures was characterized as a challenge. This project would offer new opportunities for research co-

operation between departments and also between domestic research groups including aesthetics which is still seeking its place in the department. Since the global variety of philosophical traditions involves various Western approaches, this approach might also increase the discussion with continental European philosophy.

13.7.5 Action of successful development

The department has strongly improved its research work by reintroducing the study of the history of philosophy in the 1990's. It has a successful internationally oriented PhD training program which encourages studies in good departments in Europe and U.S.A. Concentrating on central issues has been a successful choice in research policy. The research groups have been very active in seeking external funding, partially in co-operation with philosophers from other departments. Some members of the panel feel that the supervision of PhD students might be too authoritative.

13.7.6 Concluding remarks

While the research is of high international quality and concentrates on central philosophical issues, the groups are pretty small. A new position in the philosophy of mind as well as new post doc research positions would essentially improve the research capacity. A project on the variety of philosophical traditions in East and West would be a new opening with considerable significance for society.

14. Panel 9

14.1 Introduction

The below assessments are based on the self-evaluations of the departments, the figures provided by the evaluation project, and various checks and studies of the references given in the self-evaluations, in particular publications.

The site visits provided additional documentation, including inspection of the premises and of exhibitions of key publications. The interviews and discussions with a broad range of members of the departments were of key importance. Everywhere the assignment was met seriously and the evaluators with much kindness and collegiality. In fact, the whole exercise was a model in organization, meeting the total costs of SEK 8 million.

The provided written material was sufficient, even though “last second” batches of documents could not be digested before the interviews. Regarding the self-evaluations, it might be added that these were merely descriptive - even slightly defensive - and held only few visions for the future of the departments regarding research. This is all the more surprising since the research and the publications of the departments in general are of a high quality.

It is difficult to measure humanistic research along the same lines and norms as scientific investigation. Two examples: monographs will tend to rank equal with papers; and, number of quotations is highly dependent on the particular research environment - World or pan-European for some, a few countries or even provinces for other, irrespectively of quality. Thus, the “world top” mark rarely applies here.

Certain general conditions of work, as well as certain bodies - including the SALT initiative - should have been explained in the submitted material. The electronic aspects of the assessment were rather heavy, including various hardly used tools for communication among the evaluators.

The departments assessed were

1. Economic History
2. Archaeology and Ancient History
3. Cultural anthropology and Ethnology
4. History
5. Multiethnic research, and programme for Holocaust and Genocide studies
6. ALM = Archive science, Library and information science, and Museum and cultural heritage studies
7. History of Science and Ideas

14.2 Department of Economic History

14.2.1 General assessment

The department has a long standing as one of the central institutions of economic history in Northern Europe. It is a highly productive research unit. The scope of the research is rather broad, but can still be grouped under three main headings: general social and economic history, labour markets and welfare policies, and financial and business history. However, the borderlines, between the three groups are not stricter than allowing people to move between the fields and to combine different research interests. The research reflects the fact that the department is situated on the borderline between the Humanities and the Social Sciences. This is visible both with regard to the diversity of subjects and in the methodological and theoretical approaches. The department seems to be well balanced when it comes to age and gender composition, and at the visit exhibited itself as a well functioning entity.

14.2.2 Quality of research

The research activity is in general clearly of an internationally recognized standard, and most of it should be evaluated as meeting high international standards. In particular we want to point out the research concerning labour market and financial and business history. In general the research activity is solidly based on empirical studies. At the same time we find highly qualified application of relevant theoretical approaches, e.g. the use of neo-institutional theory which was introduced early into Swedish economic history by members of the department. This also applies to the quite significant amount of commissioned research where the department has succeeded in keeping a very high scholarly standard. In addition this research facilitates fruitful interaction with society.

14.2.3 Research environment and infrastructure

The research environment is clearly favourable and stimulating. The different research groups and individuals gave the impression of mutual respect and appreciation as well as willingness to support each other. The department has a long record of financing a high percentage of its research activities through external funding. In this context the administrative infrastructure at the department seems rather thin. The staff expressed some concern regarding the amount of time spent on administrative tasks. In spite of these problems the general mood was optimistic regarding future research opportunities and ability to attract external research funding. This implies recruitment of new personnel. In the short run the supply of qualified candidates for research seems adequate, but in a longer perspective the question of securing sufficient num-

bers of talented people trained in economic history and neighbouring fields should be given attention.

14.2.4 Networks and collaborations

The different research groups all have extensive international networks and are well positioned to profit from continued scholarly collaboration. Internally they have also developed well functioning connections with departments and research groups in the Humanities as well as in the Social Sciences. Through several projects of collaboration the groups have been able to take advantage of their position as a mediator between different research traditions.

14.2.5 Opportunities for renewal and emerging science

The department as a whole is in a phase of expanding their research activities. Traditionally the activity of renewal and regeneration within the department has been quite high and the present strategies are clearly confirming this ability. In particular we want to draw attention to the planned development of a Centre for Financial and Business History. Considering former activities in the department and in the collaborating institutions, as well as the competences of the key persons involved in the project, the ambitions in this field are well founded. The activities of such a centre may also profit from contributions by other groups within the department e.g. working with labour and gender history. In perspective of the very dynamic development of business history internationally and the quality of preparations, the realization of this Centre deserves full support by the University.

14.2.6 Actions for successful development

To realize the full potential of the planned research activities in the department, the infrastructure needs improvement at the department level and probably also at superior levels. This is also essential to secure the quality of research and the stability of future external funding on the same high level as in the past.

14.2.7 Other issues

The financing of doctoral training at this department, as well as in most of the others we have visited, causes serious concern. To compensate for a falling number of doctoral students, the university needs to consider how to increase the number of post doctoral positions. This is important to maintain a critical mass of highly qualified research talent necessary to fulfil future research ambitions.

14.3 Department of Archaeology & Ancient History

14.3.1 Department Profile

The department of Archaeology and Ancient History consists of three sub-disciplines with different research traditions and aims: African and Comparative Archaeology, Nordic Archaeology, Classical Archaeology and Ancient History (Egyptology, also in the department, is not a part of this evaluation).

African and Comparative Archaeology

Supported by substantial external funding over many years, it has been possible to start a completely new research direction which has wide-reaching contacts and important ramifications both within Uppsala, and abroad. The significant GIS profile of the department stems from this branch of archaeology. African and Comparative Archaeology has been largely the organizational work of P. Sinclair and in view of its importance, funding ought to be made available for its continuation in the form of, for example, a lectureship in African and Comparative Archaeology (World Archaeology). The PhD students, both Africans, Swedes, and others, have had considerable success and produced numerous theses, books, articles based on substantial field-work in several countries and continents (eleven African countries, Laos, Sri Lanka, and Bolivia).

The challenge is to integrate this development into the general archaeological profile of the department, in particular if funding should diminish.

Nordic Archaeology

Traditionally, Nordic Archaeology has been very strong in Uppsala, in particular in Late Iron Age-Viking Age, but other periods are also studied, including Stone Age. The sub-field has been strong in formulating interesting research perspectives with historical implications. At present, the sub-field is undergoing a period of fruitful redefinition of many research goals. It is also one of the archaeology departments in Scandinavia which has made the most use of textual material. Part of the energies is devoted to the publications of the old Valsgårde material, a large Late Iron Age chiefly burial ground and compound of European importance, which has also been the focus of recent excavations.

Classical Archaeology and Ancient History

Many different individual research projects are being carried out in this sub-field, ranging from the Bronze Age to Late Antiquity. At present there is only one active field project (Labraunda), but researchers are engaged in the publication of the Tegea and Asine materials. Ancient history is in part heavily integrated with Classical Archaeology but independent Ancient History publications also appear.

Common Interests

GIS is a new area of potentially common interest to all subjects of the department. The researchers have actively been seeking collaboration with other disciplines and departments. An MA in laboratory archaeology and GIS is being run in collaboration with Stockholm University. Collaboration with Riksantikvarieämbetet and many other institutions, also abroad, is common. Outreach and production is high, and in some cases even impressive; unfortunately the interesting TOR annual has come to a hopefully only temporary halt. The demographic profile is satisfactory at present. Popular and media activities are quite common.

14.3.2 Quality of Research

African and Comparative Archaeology: Top-quality or world leading research has been achieved, which hopefully can be sustained. Nordic and Classical Archaeology: internationally recognised standard to internationally high standard.

14.3.3 Research environment and infrastructure

Both seem as good as can be expected. There is a high availability of computers and other facilities, and the GIS-lab is very impressive. There are spacious premises and sufficient work-space also for PhD-students and post-docs.

14.3.4 Networks and collaborations

There is participation in a large number of networks. The researchers are involved in international collaboration to a high extent. The department emphasised their interest in the possibilities presented by the SALT initiative for research collaboration across several faculties.

14.3.5 Opportunities for Renewal and Emerging Science

Junior faculty and PhD students seem to be well cared for and to have a good working environment. Most of the senior staff are close to sixty, however, and the department should consider hiring junior personal in the near future.

14.3.6 Actions for successful development

It is our impression that the scholars know full well what should be done to improve their research. Although, the Classical archaeologists in particular emphasize that they have a separate research tradition from Nordic or World archaeologists, there is already much collaboration, for instance, in developing GIS and landscape perspectives. It is also our impression that in the future

there will be more collaboration between the different sub-disciplines. For example, there seems to be a common interest in questions concerning mentality and religion which it might be fruitful to explore further.

14.3.7 Other issues

The doctoral students seem very well-integrated into the department. There are also a number of post-docs. Funding has been sufficient in some areas, but other areas have been less successful in this respect.

14.4 Department of Cultural Anthropology and Ethnology

14.4.1 General assessment

Among the principal foci of the Department of the sister disciplines of anthropology and ethnology are changing identities and multiculturalism, leading to questions concerning political ecology and globalisation which in their turn impinge upon social and political organisation. With research conducted in quite different regional areas ranging from West Africa and the circumpolar rim (anthropology) to mainly urban areas in Sweden (ethnology) different research groups and individual scholars have pursued a broad spectrum of questions; even so, there is a repeated return to conflict, exclusion and vulnerability.

14.4.2 Cultural Anthropology

Research by present scholars has been undertaken in Africa (West Africa, Tanzania, Uganda), in Afghanistan, Cambodia and Thailand, in central South America, in the USA (Texas), in Bolivia and Columbia, in North Sweden (Sami) and the Kola peninsula in Russia (Sami). In each case the researcher obtained a measure of fluency in the native language. Particularly important to the field researchers were return visits. It is worth noting that these did not simply mean a recording of changes that may have taken place *in situ* but also opened the researchers to new perspectives regarding their “understanding” of the cultures. Departmental seminars, a regular feature of the anthropological section, also with visitors from abroad, have also served the same function. All in all the Uppsala anthropologists have produced noteworthy and innovative scholarship.

14.4.3 Ethnology

The ethnological research is conducted with international partners and in particular concerns new modes of urbanism and multiculturalism. Special men-

tion should be given to the nationally and internationally recognised research on children, youth and women, conducted in collaboration with local authorities. As to theory, new angles have been made in gender studies and studies of late modern urban societies. This strong theoretical foundation also leads to new insights concerning marginality and areas of conflicting traditions and senses of history. With the ethnological research stemming from an interest in the indigenous Swedish culture, the historical point of view is not missing; rather, the problematization of concepts such as cultural heritage and otherness furthers ones understanding of the Swedish experience.

The ambition of the anthropological and ethnological research in Uppsala is that it should have an impact on social practices at the local level; in short an applied anthropology/ethnology. This speciality amounts to a truly humanistic approach.

14.4.4 Quality of research

In depth research undertaken in several continents has become the hallmark of this Department. This research certainly is of a internationally recognised standard, indeed, some of the results can be rated as of high international standard. This promises to continue.

14.4.5 Research environment and infrastructure

During the years 2003-07 anthropology produced more than ten, ethnology somewhat fewer PhDs. At the moment there are 27 PhD students working at the Department. These are success stories of which the Department has every reason to be proud; however, there is a 'down side': the supervisors are being overextended. They need and should be entitled to additional colleagues. Fortunately the Department has been reasonably successful in obtaining external funding and this means a measure of relief.

14.4.6 Network and collaborations

The research groups and individual researchers enjoy fruitful collaboration. The international and national networks are in good shape; especially the LBC (Living beyond conflicts), the network for Circumpolar studies and Forum för skolan should be mentioned. Fieldwork generates new networks both local and beyond, as well as new colleagues.

14.4.7 Opportunity for renewal and emerging science

To continue and to further the research, the already high support of external funding must be guaranteed or supplemented by new arrangements at the personnel level. External funding projects also in new areas are promising. The

double mission of research in indigenous affairs and multiculturalism will always be relevant and the Department seems to be highly aware of this challenge. The role of the qualified research directors is nevertheless crucial to ensure future research.

14.4.8 Actions for successful development

A successful development means innovative theoretical thinking. An outstanding example is the way in which research into Sami reindeer pastoralism developed into research in political ecology. Similarly the ethnological studies in urban multiculturalism with their transnational connections are now generating even more intense networks. The international networks will guarantee successful development in the future.

14.4.9 Other issues

Two related points. First, action must be taken to secure research after the leading anthropologists/ethnologists leave the scene. Second, it is essential for the continuance of the present high standard of research - and - teaching that means be found for the retention in the Department of more of its post-docs.

14.5 Department of History

14.5.1 General assessment

History has indeed a long and glorious tradition at Uppsala University, which is a source of pride for the department. The self-evaluation report has also emphasized that this tradition is a history of continuous readiness for change. It remains, however, uncertain what influence the very large projects from the late 1960s and 1970s have had for the generation now working in the department. Analyzing this feature would be interesting for the self-understanding of the tradition of the department.

In contrast to these former heavy specializations the department now represents a generalist ideal. It wants to cover the entire chronology from the Middle Ages to present time in research, and it demands of every teacher a general education broad enough to make her or him competent to teach all courses at ground level from Antiquity and onwards. This has, as it seems, a good effect on the educational activities in the department. Education appears to be of high quality at all levels. The seminars of the department attract doctoral students and master students from other departments too. The panel wants to commend the so called base groups, in which researchers with common interest, ranging from master students to professors, are welcome to discuss their problems.

Although the research of the department is mainly focused on Swedish history, it also includes some studies of foreign countries and earlier periods, e.g. quite a few contributions to Indian history. It also seems that the education programmes of the department covers European history, but otherwise the panel could not observe any special interest in continental European history or European integration history. Individual research and free choice of research topics have often been characteristic of academic history in Sweden, and still is at the department in Uppsala. However, the example and encouragement of the professors is of decisive importance. Items regarding the history of labour and the role of women, refugee problems in modern history, and research concerning the national debts are mentioned as fields of particular interest in the future.

The panel got the impression that there is an open collegial atmosphere at the department, which makes it function well. The production of dissertations is high, and we were told that people graduated from this department are normally attractive on the labour market. The staff holds no doubt very high quality. This being said, the panel has to report that there were few signs of an ambition to renew the orientation of the research in the future. The self-evaluation report leads to the conclusion that what is needed is primarily increased resources, which is neither surprising nor a desideratum characteristic of this department only but probably rather unrealistic in a period of increased competition.

14.5.2 Quality of research

Internationally recognized to high standard.

14.5.3 Research environment and infrastructure

The new premises in the old chemical laboratory appear to be remarkably functional and the infrastructure at large holds a very high standard.

14.5.4 Networks and collaborations

There is obviously a readiness for collaboration and creating of networks at the department. As prioritized collaborators within the university economic history, church history, and anthropology were mentioned in that order. A considerable amount of international partners was reported in the material presented in advance to the panel and commented upon at the site visit. Although we did not hear much about its activities so far, the panel wants to commend the SALT initiative, which seems to have great potential for promoting cooperation between scholars in the Engelska parken area.

14.5.5 Opportunities for renewal and emerging science

As already mentioned above, there is an open atmosphere at the department, which is a *conditio sine qua non* for renewal. The number of PhD students will probably go down substantially, and the intention is to increase post-doc positions instead. This will likely lead to a reorientation of ongoing research, but no policy for renewal was documented.

14.5.6 Actions for successful development

The present staff of the department holds such a high quality that they guarantee a continued production of good research, and there is a great number of qualified applicants for vacant positions. The department may, however, make better use of the facts that one of the leading writers of popular history books in Sweden is affiliated to its staff and that prominent emeriti are still active in research.

14.6 Centre for Multiethnic Research & The Programme for Holocaust and Genocide Studies

14.6.1 General assessment

The Centre and the Programme are two separate institutions which share the same administration. They exist as two independent entities within the university. They are research units, but they also contribute to the teaching in several departments of the University and offer their own courses in topics associated with their research. The research pursued by the Centre is concerned with minorities, ethnicity, ethnic conflicts, genocide and the Holocaust. The panel stresses the importance of a continuous analyses of these and related notions (*Begriffe*) regarding steering effects of the populist pressure on the terminology. Much of the research has been concentrated on multiculturalism in the Nordic context, in the Balkans and elsewhere in Europe. In Sweden the questions of the indigenous minorities and their languages and literature is in focus. The interdisciplinarity of the Centre is reflected by the researchers who have their backgrounds in history, the social sciences and linguistics. This seems to be very fruitful and our impression is that the Centre functions as a very creative and productive research unit. Interdisciplinarity in itself seems to be inspiring and to generate new ideas about how to analyse and deal also with topics which represent extreme human desperation. The Centre emphasises its humanistic approach to questions which are usually the concern of social scientists. There is also a good deal of overlap in research interests between the Centre and the Programme; the same researchers work on projects within both the Centre and the Programme.

14.6.2 Quality of research

The quality of the research activity certainly meets internationally recognised standards. Much of the research on the Balkans seems very innovative. The research on multiculturalism in Sweden has also been highly regarded and much needed from a national perspective.

14.6.3 Research environment and infrastructure

Although the Centre and the Programme are separate units with different tasks they have common research interests and goals as well as publishing canals (for instance, the popular journal *Multiethnica*). Several doctoral students from various disciplines have been and are associated with the Centre. The researchers emphasised the significance of environment provided by the interdisciplinary nature of the centre for their own research which they felt could not be pursued in the context of traditional university departments.

14.6.4 Networks and collaborations

The Centre has close contacts particularly with the Departments of History and the Department of Anthropology and Ethnology, with whom they share similar research interests. The individual scholars are active in international and national networks and are often requested by the media to comment on important ethnic and political matters. Their involvement in society reflects that their expertise is much valued and needed. Another factor which distinguishes the Centre from traditional university departments is a strong social engagement.

14.6.5 Opportunity for renewal and emerging science

Although many researchers are associated with the Centre, the permanent staffs is very small and a greater number of permanent positions would certainly benefit the Centre. Still the researchers are finding ways to renew their research through close contacts with several departments in the university and through their international contacts. The close connection between teaching (also for administrative staff in several state administrative institutions) and research is very important, as new findings are transmitted without delay. The Centre also attracts new researchers from other fields such as theology, law and the languages. Their special expertise is widely sought both within and outside of Sweden.

14.6.6 Actions for successful development

The move to the campus Engelska parken will probably be beneficial as it will make contacts with researchers in other humanistic departments even easier

than they are at present. The continued support of the university as well as of the national authorities is crucial to the further development of the Centre.

14.6.7 Other issues

This seems to be a successful example of how this kind of interdisciplinary research centres outside the traditional department structure can be very effective.

14.7 Department of ALM (Archive Science, Library and Information Science, and Museum & Cultural Heritage Studies)

14.7.1 General assessment

The department of ALM consists of three disciplines with different traditions and aims and related to three different professional educations: Archive Science, Library and Information Science (LIS), and Museum & Cultural Heritage Studies.

The department of ALM is young and so are the three disciplines as academic disciplines in Sweden. The department of ALM is in a rapid phase of expansion, especially due to *Library and Information Science* which has the Masters programme with the largest number of applicants among all subjects taught at Uppsala University.

The number of researchers is very small. Hence the research effort is also very small and does not live up to what would be expected from a University running an education at an advanced level (due to poor coverage of subfields).

Library and Information Science consists *internationally* of a range of subfields, among which the most important are (in alphabetical order):

- Bibliometrics
- Cultural policy and cultural studies, including cultural issues related to children and different target groups
- Document, genre, media, literature & communication studies
- Information and knowledge management
- Information retrieval (including research related to bibliographical databases and Internet search engines).
- Information seeking and use studies
- Knowledge organization (classification, indexing and description of documents and informative objects).

It is important that the Department of ALM build up qualified personnel in those fields and that they develop their humanistic orientation in relation to those fields and contribute to their integration with other scholarly fields (e.g.

historical source criticism, philosophical issues in classification, humanistic perspectives on digital media and so on).

At the present time only BHS in Borås is doing research on a broad front within LIS. It seems almost “cannibalistic” that the department of ALM in Uppsala attracts the greatest part of the master students, while BHS carries out almost all research in the field, has 4+ professors etc.

The research volume in LIS seems to be below a critical size in Uppsala, why it is important that the rapid expansion of research in this field continues.

Also within Archive Science and Museum & Cultural Heritage Studies the research volume seems to be below a critical size.

Besides the three mentioned disciplines the department is developing overall research and teaching in the field of ALM. This is important, also theoretically, because digital development and media convergence make comparative perspectives urgent.

14.7.2 Quality of research

The research potential of the ongoing research can be considered commendable. The most important research fields at the department being at present:

- An international and interdisciplinary field concerned with the relationship between the Law and the dissemination of and access to information and culture.
- An analysis of Swedish administration in different periods covering aspects of archives, administration, politics and culture.
- Knowledge organization from a domain-analytic point of view
- Processes in contemporary reading groups

The quality is good, but as stated below the amount of available resources is below a critical size. Research activities are expanding, and we trust that the staff can manage this growth and a high standard can be maintained.

The biggest need at the present is research concerning digital media and bibliometrics. Bibliometrics is a fine way to combine research questions in scientific communication with information retrieval skills, which are core competencies within LIS. It is critical that such research is initiated at the institution. Due to the department’s humanistic approach it is also important that metatheoretical issues concerning the ALM disciplines be considered. Also, in Linné’s home town should not studies of classification be visible in a field devoted to, among other things, the organization of knowledge?

14.7.3 Research environment and infrastructure

The research environment is rather small. Women are well represented. There is an intake of young researchers as well as visiting scholars.

14.7.4 Networks and collaborations

There is collaboration with the NORSLIS research school. ALM has also provided virtual research seminars with other universities.

14.7.5 Opportunities for renewal and emerging science

Uppsala has good opportunities to influence LIS in a fruitful way, partly based on its devoted humanist approach to LIS and relations with other disciplines within the university and partly based on its ability to attract highly qualified students with a solid background in different fields.

14.7.6 Actions for successful development

Most important is the attempt of the institute to recruit more personnel (research assistants, PhD-students etc).

14.7.7 Other issues

The department of ALM is cooperating with other universities and uses their courses and supervisors.

14.8 Department of the History of Science and Ideas

14.8.1 General assessment

History of Science and Ideas was introduced as an academic field in 1932, when Uppsala University received a donation of a chair. For three decades this chair remained the only one in Sweden, but starting in Gothenburg in the 1960s the discipline is now represented at nine higher education institutions on MA and/or PhD level and at many more on lower levels. History of science, or history of ideas, or both - the discipline is known under different names - has in fact become one of the most attractive among subjects in the humanities.

In more than one respect, the self-evaluation report is marked by the successful development of the discipline. It gives a picture of a traditional institution, in which quite a few very talented doctoral students, post-docs, and senior scholars are working individually with problems of their own choice. It emphasizes the broad spectrum of research fields at the department and the high quality of its products: history of science, history of medicine, history of philosophy, history of political ideas, but also more modern areas such as media research and science and technology studies (STS) are mentioned. At first sight this list gives a very fragmented picture, but the panel was informed at the site visit that there are in fact four groups of scholars, who are informally cooperating in solving related research problems. The panel notices with satisfaction that it has been possible to recruit a number of PhD students interested

in the history of medicine, which is a theme that certainly deserves to be continued.

History of science forms a section of its own around the Hans Rausing chair, which was donated to the university some years ago with Tore Frängsmyr as its first holder. During his time in office an impressive international network has been established, and the panel thinks that he should be commended for his successful entrepreneurship. However, we appreciate also that a closer cooperation between the department and the - obviously relatively independent - section has been listed in the self-evaluation report as one of the most urgent desiderata for the future.

Since the time of Sten Lindroth scholars from this department have become prominent figures in Swedish culture. Professors Karin Johannisson and Tore Frängsmyr have both published a number of beautiful books for the general public, and they are now engaged in two great synthetic projects on the history of Uppsala University and the Karolinska Institute. This is a tradition that ought to be kept going by future generations at the department as a useful way of fulfilling the “third duty” of the university. The panel therefore is very concerned about the decline of subscribers to *Lychnos* and strongly recommends actions to save this valuable yearbook.

14.8.2 Quality of research

The research activity is generally holding an internationally recognized standard, and some of it comes close to the highest level. Most of the monographs have been written in Swedish, but there are also quite a few available in English and other translations. The discussion at the site visit gave convincing proofs of a dynamic and enthusiastic group of scholars that very well knows where they want to go. In spite of the fact that financial resources will continue to be scarce, they are looking forward to the future with great expectations.

14.8.3 Research environment and infrastructure

The premises in the old physics building have been well renovated, and the infrastructure appears to be adequate.

14.8.4 Networks and collaborations

In addition to what has already been said above it should be noticed that the international summer school for PhD students from the department, the University of Bologna and Berkeley, which was initiated in 1988 by Tore Frängsmyr, is still active. The panel also commends the fact that the department has succeeded in finding means to make it possible for most of the PhD students to spend a year abroad during their studies. Even if it may prolong the study time marginally, a stay at a leading foreign university should be given high prior-

ity also by PhD students in the humanities, and the department sets a good example for others in this respect.

14.8.5 Opportunities for renewal and emerging science

The panel had the pleasure of meeting Frängsmyr's successor from August 1 this year, Professor Otto Sibum from the Max Planck institute in Berlin, who is trained as a physicist as well as a historian. Listening to him made it clear that he will be able to considerably renew the science history parts of the research program of the department. The SALT activities, of which one of the PhD students informed us, may also enhance the opportunities for closer cooperation with other departments.

14.8.6 Actions for successful development

The department should be supported by the faculty with one or two more positions as assistant professors.

14.9 General conclusions

By any standard, the physical environment of the departments is highly satisfactory, even spacious and aesthetically beautiful. The upkeep is superb. This no doubt is a very important factor for the work, yielding a sense of pleasure, belonging and pride to all, including the students. Facilities also seem sufficient.

The research level and the level of productivity of the departments under study are generally quite impressive, in particular taking into consideration the very high teaching load of the tenured personnel, which includes the burden of supervising a large number of PhD-students. The stipulated amount of supervision seems very high (presently 10% of the teaching load for one teacher per student) and may be somewhat reduced without dramatic adverse effects. The high number of PhD-students is a definite asset, not least in terms of research carried out.

To raise the level and the scope of research the teaching load (usually a high 80% among tenured personnel) should be lowered. Time for preparation was not stipulated but twelve hours of lecturing per week is common. Such teaching load must be among the highest in the World. We suggest that the teaching load should never exceed 67% on the average for all tenured researchers. We also suggest the creation of more post-doc positions, and hopefully with more teaching than today. (We are of course aware that post-docs are already relatively common in the humanities, but their teaching potential is poorly utilized.) This suggestion is also in support of potential candidates for new research and teaching positions.

We note that there is a broad range of mutual overlaps between departments. This potential should be exploited. We therefore suggest reserving an annual budget at the level of faculty for interdisciplinary networking activities between and beyond departments (cf. the fine experiences with SALT).

We are much aware of the danger of raising the administrative load by further activities. Administration is already a heavy burden to the tenured and non-tenured staffs. In fact, one should consider integrating new departments, centres, or special activities within already existing academic and administrative bodies. The latter may even be given such a size that professional academic administrators and advisors can be hired at the level of institute. Certain central functions should remain with the faculty, however.

Traditionally, individual action has been much praised. Today, attention must also be paid to academic collaboration and research leadership, creating important informal structures within the departments.

It is the impression of the evaluators that the secretarial support is often too limited, adding to the said administrative burdens of the researchers and teachers.

There is thus a certain, even critical unbalance between the activities and the manpower provided. When the output or production is nevertheless high, we suppose that many researchers are adding substantial personal free time to their paid job (cf. the prospect of promotion to a personal professorship).

The transfer to electronic publication should be encouraged. This will eventually lessen the high library costs - including the housing burden - of departments, faculty and university. The present libraries will eventually house both an active, usually electronic component, and "museums of not yet digitalized scientific literature".

Also, the current publication review syndrome is likely over-valued. Where and when good researchers are hired, these will always optimize and publish in the most prestigious media.

Popular publication and other public activities should also be encouraged and supported.

Finally, we would encourage the departments to engage internationally to an even further extent, including action at the European level (in particular the EU countries). The latter are possibly somewhat ignored under the battle cry of national action at the level of globalization. EU funding is no doubt a raising factor, and the EU Socrates programmes of truly great importance.

In fact, all PhD students should spend some time abroad; and no academic personnel tenured without international academic experiences.

15. Panel 10

15.1 Department of Law

15.1.1 Introduction

Our panel has cherished the possibility of providing this evaluation. We found our site-visit fruitful and inspiring. The Faculty of Law received us very positively and warmly. The overall atmosphere was unreserved and easy-going. The members of the staff were all approachable and forthcoming, and they were willing to answer our questions frankly and openly. They were flexible for our wishes concerning the alteration of the program. All interviewed researchers appeared to be enthusiastic about their individual research undertakings.

Our evaluation has been based on a limited material, and an in-depth analysis of all research done in the faculty of law has not been possible. The panel members knew beforehand a big part of the books and articles produced. The evaluation procedure had beside that material relied on interviews. Aside from hearing the presentations of various fields of law, we were able to meet doctoral students and post-doc researchers separately to hear their views and concerns.

However, it is necessary to bring out a few critical observations on the arrangement of the site visit. One problem was related to incoherence of introducing various fields of law within the faculty. The presentations failed to be consistent regarding such issues as the number of staff and the degree and quality of domestic and international networks and collaborations. A particular problem was related to the presentation of private law as one single block, with the outcome that various sub-fields of private law were unable to present themselves appropriately. We also thought that the self-assessment was too unclear as regards its evaluation criteria insofar as its quality assessment was concerned.

15.1.2 General Assessment

The faculty is steeped in inspirational history and heritage which have secured the faculty a high international prestige and profile and a firm foundation. There has recently been a shift of generation and younger scholars in a number of areas are naturally not yet in the same standing. We feel that this group has great potential.

As with other law faculties in the Nordic countries, the faculty has the problem that the teaching obligations combined with a small group of teachers result in a limited critical mass in each subject. The outcome is also that the balance between teaching and research is inappropriate especially insofar as university lecturers and promoted professors are concerned. We do know that this owes to the peculiarities of the Swedish system but we are highly critical of their impact on the possibilities to conduct a successful research. The Swedish system limits the possibilities of the faculty to compete with other research units in the Nordic countries and elsewhere on equal footing because the other universities have reserved more time for research.

There are trends towards interdisciplinary research. Nonetheless, we feel that there is still room for expanding the scope of interdisciplinary research for instance in the direction of the sociology of law and law and economics.

The panel is very critical of the consequences of the promoting system. We know that it is the common system in Sweden and we are familiar with its reasons. The lack of competition about the research positions, on the one hand, and the lack of mobility, on the other hand, inevitably result in a risk of moderate quality of research in the long run. This also impedes critical thinking and renewal. We also find that the number of recruited doctoral students is much too low.

The panel is of the opinion that the administrative support to research should be strengthened. This would contribute to possibilities to apply for EU-funding and other external funding.

The panel is concerned about the lack of a long-term strategy and an action-plan regarding research areas to be covered in the future, research priorities, ways of responding to the European and international demands, etc. Information of this sort is especially important to those at the beginning of their academic career.

The faculty has been successful in obtaining a good age structure and gender balance that paves the way for a promising future.

There are valuable and close contacts between the faculty and practitioners, ministries, etc.

15.1.3 Quality of Research

The following criteria have been used to identify strong areas of research, emerging science and potential for renewal:

- an international interest in and respect for the present-day research
- a potential for increasing in the quality and quantity of research
- an ambition for increasing in the quality and quantity of research
- a strategy for increasing the quality and quantity of research
- the feasibility for realization
- an openness to various theoretical approaches
- an openness to new methodological approaches

- an openness to interdisciplinary co-operation
- an openness to international co-operation and influence
- attractiveness of research in the eyes of young researchers
- attractiveness of research in the eyes of financiers
- the interaction with the society and the importance for society in general

Generally, the panel has been quite impressed by the overall quality and quantity of legal research done by the faculty. The research covers most traditional fields of law and concentrates on Swedish law. A new trend has been the effect of European law on Swedish law. The main part of research is traditional legal scholarship (legal dogmatics) and, as such, ascends to the level of a high quality. However, the panel has paid attention to the scarcity of theoretical and methodological reflection in some parts of legal dogmatic research. There seems to be a lack of sufficient interaction between legal theorists and scholars in other fields of law. A change in the doctoral courses, including more theoretical and methodological courses, seems to be taking place, however.

Traditional monographs still have a predominant role in the publication profile of the faculty and most of them are written in Swedish. The language, however, has not featured as a criterion in the panel's evaluations.

Recognizing a generally high quality in the faculty based on the criteria above, the panel recommends that the following areas should be selected and be given extra possibilities for development through funds:

- The combination of international private law and family law, especially with its multicultural aspects
- The areas of research overlapping international human rights law, European law and constitutional law
- The areas of research involving comparative and interdisciplinary approaches to legal history
- The areas of research involving the interaction between criminal law, European law and international law

The panel emphasises that the selection of especially strong areas of research and successful research constellations has been based on the available information. This means that it has not been possible to conclude that other research areas actually have a lower standard than the selected areas. Given more information they might have been included.

In addition, the panel notes that some research areas are very promising future areas, e.g. medical law, but they are still so much in an early phase that it is premature to invest in a very large increase in staff and fundings. We also think that in many areas there are high-standing individual research.

15.1.4 Research Environment and Infrastructure

The panel has been impressed by the number of scientific seminars and guest lectures by distinguished professors and other highly qualified researchers.

The faculty members also actively participate in Nordic, European and international seminars and other research activities.

However, we recommend the faculty to invite foreign professors and researchers to stay in the faculty for longer periods of time.

The panel is also delighted to find out that the faculty has earmarked money enabling researchers to go abroad. However, the faculty should continue to encourage researchers to go abroad for longer periods of time since this possibility is still used very scarcely. We find this especially important insofar as doctoral students are concerned.

The doctoral candidates were highly motivated. They found their supervisors and senior researchers both accessible and supportive. They appreciated their research training and environment.

15.1.5 Networks and Collaborations

The panel finds that almost all research areas and researchers are actively participating in national and international networks. The collaboration in joint transnational research projects is at the same level as in other Nordic top universities. In some fields of law (e.g. international private law) international networking and collaboration ascends to a level of very high quality.

15.1.6 Opportunities for Renewal and Emerging Science

- A. Scientific quality: see above
- B. Ideas/realities: see above
- C. Junior faculty activities:

The doctoral students were very satisfied with their research training and environment as well as research infrastructure. They were content with the intensity of interaction between the doctoral students themselves as well as with senior scholars. They found senior scholars supportive and approachable.

However, the doctoral students were worried about their long-term academic prospects after completing their doctoral studies. They lamented their limited and uncertain academic scenarios in Uppsala and in Sweden in general. The panel shares this concern and strongly feels that the current “recruitment structure” of the faculty is not sufficient to guarantee enough post-doctoral research positions or equivalent opportunities. As a consequence, opportunities for renewal and emerging fields of legal research are also severely limited. Another bottleneck continues to lie in the current recruitment system of new doctoral students. In conclusion, the panel recommends a long-term strategic planning to deal with these concerns and challenges.

15.1.7 Actions for Successful Development

The panel finds that there is a lack of joint research projects. We feel that even the excellent individual research done at the faculty could be strengthened by opening for new ideas, theoretical inputs from other fields of science and other faculties of law. Such a change is also important for the faculty to succeed in the competition for research grants both at national and EU level. While such a change is eventually up to the initiatives of individual researchers, we think that the following institutional arrangements and incentives can assist to carry out this change:

First, the faculty should have an explicit discussion about its general research policies, stating the priorities and development areas in future research.

Secondly, part of the faculty or university financing of research projects could be allocated to projects that include cooperation with other law faculties in Sweden and elsewhere, interdisciplinary cooperation and cooperation within different fields of law in the own faculty.

Thirdly, the faculty should consider that a number of chairs will be maintained and filled, as they become vacant, after an international or at least Nordic announcement. Especially distinguished professors who bear responsibility for the development of research can attract external funding. Professors appointed after an international competition will have good possibilities for influencing the intellectual climate of the faculty in a positive way. The fields of the chairs should be defined broadly enough in order to attract many highly qualified applicants. In addition, a record of interdisciplinary cooperation should be included in the selection criteria.

Fourthly, as we have already stressed, longer visits of researchers both from Uppsala to foreign universities and from foreign universities to Uppsala should be encouraged.

Fifth, the panel finds that the number of doctoral students is too low, both for the future sustainability of the faculty and for the intellectual environment for the doctoral students. One of the reasons for this is that the number of important research areas in law is growing rapidly. Therefore, funds should be allocated to recruit more doctoral students.

16. Panel 11

16.1 Faculty of Theology

16.1.1 General assessment

The visit and general impression

During its stay in Uppsala, the panel has visited the Faculty of Theology for three days. The panel has conducted interviews with representatives from the department's eleven research disciplines organised in five administrative sections. The representatives were predominantly the professors of the disciplines. Furthermore, the panel visited the centre for the study of 'Religion and Society' and had an interview with the academic management at the centre. Two interviews were arranged with PhD students, both representatives and a sample of PhD students from the five sections of the department. The panel also had two opportunities to interview the Dean, the Head of Department and the Faculty Director. On the last day of the site visit the panel found it important to see and ask questions at the Karin Boye Library.

The visit has been well organised by the department and all the requested information, additional statistics, etc, has been made available to the panel. All those who took part in the panel's visit, either as representatives or as part of the management of the department, have been positively engaged in the project of 'Quality and Renewal'. The panel has met a spirit of cooperation and willingness to address the subject and to take part in the further development of research to the highest standard at the Faculty of Theology at the University of Uppsala.

The panel has carried out the interviews using roughly the same template consisting of three main questions:

1. We have asked the representatives of the sections about the identity of their discipline.
2. We have asked the representatives about their visions for their disciplines.
3. We have asked the representatives about their contribution to the 'currently active particularly successful research areas' and to the proposed 'most promising future research directions of the department' (cf. the self-assessment made by the department: A2 and A3).

In most cases, the questions were followed by discussions on these themes:

1. The amount and structure of PhD education in the respective disciplines.

2. Involvement in national and international networks and collaboration.
3. Research as an individual enterprise or conducted in research groups.
4. The degree of external funding and the attitude towards external funding through the competitive funding system.

The panel's overall impression regarding the research at the Faculty of Theology in an international perspective is positive. Work is conducted in a good spirit of willingness to find new ways and new subjects and with a marked contemporary interest of the academic society and the society at large. We find a lot of ambition and energy among the researchers at the department, among senior researchers as well as younger scholars.

Recommendations

These overall impressions are followed by some panel recommendations for further improving the ongoing research at the Faculty of Theology:

- The department should stress the importance of active research of all the scholars and possibly formulate minimum requirements for the yearly size and type of academic publications according to the different categories of employees.
- The Faculty of Theology has both national and international obligations, and the chosen language used in its research publications should reflect this. The department should continue its legitimate obligation to publish in both Swedish and foreign languages, but at the same time strengthen its international visibility through international publications and collaboration.
- The relationship between the disciplines, chairs and the proposed future research directions should be clarified.
- The great variety of research going on in most of the disciplines should be focused in fewer research areas in order to create synergy.
- The department should establish guidelines for securing the scholars' research time and through a lesser degree of teaching give especially bright and successful researchers time to develop ideas, to obtain external funding and to take on a special responsibility to guide and inspire the best researchers.
- The department should establish criteria for identifying good research by means of a strategy of publication in highly esteemed refereed journals or with highly regarded publishers (books and anthologies).
- A special field of interest for the planning of the Faculty of Theology should be the ancient languages (Hebrew and Greek etc.) to secure sufficient knowledge of the students and the PhDs in order to enable the department to conduct internationally recognised research in Biblical Studies, Church History and Systematic Theology also in the future.

- To a large degree, the Biblical Studies are invisible in the department's self-assessment. It is a serious shortcoming for a faculty of theology not to have the basic studies of ancient languages and the biblical texts represented in the discipline's visions for the future.

External research funding

The total reported external research funding during the period 1995-2006, i.e. 12 years is around MSEK 70, which is an average of app. MSEK 6 per year. This is a substantial contribution to the research activity within the department. However, our impression is that the department should investigate the potential to attract more research money in the future. The need for active efforts in order to attract externally funded research projects has also been recognised by the faculty board.

Eight out of the 32 senior researchers have handled more than 70% of the external research funding during the 12-year period and a few have not contributed at all. We think that a broader effort within the department to attract external funding is very important. Scholars should be advised to orient a part of their available research time to the planning of future research.

16.1.2 Quality of research

Assessment

An example of the spread of the research undertaken at the department are the 15 books mentioned by the department in the self-assessment. All the books are published after the year 2000 and in English. Nearly all of these books were available at the libraries in the Nordic countries represented by the panellists. This is remarkable and shows that relevant and good research is conducted at the department.

As noted above the panel visited five sections and one centre. We wish to stress that the template for the research evaluation in KoF 07 underlines that the panel's task was to assess the quality of research at section level and not at the level of individuals. There may therefore be considerable differences in the amount and quality of research within the sections.

The proposed expressions for the quality rating of originality and significance given in the document 'Terms of reference for expert panels' are not particularly well suited for the assessment regarding the disciplines at the Faculty of Theology. This goes particularly for the category mentioning 'world-leading research'. The panel would therefore like to underline the additional comments on the disciplines, sections and research plans further on in this document.

Evaluation of the sections

- A. History of Religions: Internationally recognised standard.
- B. Psychology and Sociology of Religion: Internationally high standard.

- C. Biblical studies: The section has not formulated a common profile of research and the panel therefore abstains from a general remark on the research of the section.
- D. Church History and Mission Studies: Acceptable standard; Ecclesiology: internationally recognised standard.
- E. Ethics, Philosophy of Religion and Systematic Theology: Internationally high standard.
- F. The centre 'Religion and Society': Internationally high standard.

Additional comments on the disciplines

The description of the disciplines in the self-assessment and the impressions formed during the interviews give cause for some additional comments:

- There is a discrepancy between the description of the History of Religion, which mentions a wide range of 'advanced research' and the actual research completed within the discipline. The History of Religion cannot cover all the mentioned fields on an advanced level within a foreseeable future. The discipline will have to concentrate on fewer themes. During the interview the idea of concentrating on themes rather than religions came up. The panel can approve of such a strategy as well approve the effort to establish the study of Islam as a new focus in education and research, through the new and ongoing recruitment of a senior lecturer in Islamic studies. The discipline needs further international networks and collaborations.
- The description of Old Testament Exegesis has no focus on actual conducted advanced research and the description of New Testament Exegesis is only to a lesser degree describing the situation today and is mainly looking backwards. The panel only got a vague impression of the ongoing 'projects and international networks'. However, it should be noted that some of the publications are of high standard.
- The description of Church History has a too narrow scope, even if it reflects the published research in Uppsala. However, the panel acknowledges plans for renewal of the research profile.
- Mission Studies is describing plans rather than the status. The plans look promising taken into consideration that the department has employed new academic staff into the discipline.
- The section of Sociology and Psychology of Religion is mainly oriented towards empirical research on religion and world views. It demonstrates several active research efforts that have been fruitful in the past, as well as promising ideas for the future.
- The discipline of Ecclesiology needs to develop its identity in the cross field of Systematic Theology and Church History.
- The disciplines of Ethics, Philosophy of Religion and Systematic Theology have a strong contemporary relevance and orientation.

- The centre 'Religion and Society' gives evidence of a strong and result-oriented research group. The results achieved from the research activities so far have been well received, and it has ongoing and planned research projects that indicate active leadership and high academic quality. The panel approves of the fact that the centre has been combining fruitfully empirical, systematical and historical approaches in its research.

16.1.3 Research environment and infrastructure

The Faculty of Theology is housed in an attractive building which provides a good research environment. It would be desirable in extension of the integration of the centre for 'Religion and Society' to move the centre to the premises of the department in order to strengthen the cooperation.

The department is financing a part of the Karin Boye Library. The library makes a good impression and is well-functioning. The annual part of financing amounts to up to 10% of the yearly turnout (i.e. more than MSEK 5.5). This is a rather large amount of money especially related to an annual acquisition of less than SEK 350,000 including journals and serials. The panel suggests that the department should take a look at the expenditure for the library and especially the expenditure on buildings. The role of the Karin Boye Library in relation to the Carolina Rediviva Library needs to be clarified. In order to extend its outreach in research, The Faculty of Theology should secure and support a highly profiled *research library* in Uppsala.

16.1.4 Networks and collaborations

Several disciplines have established collaborations and strong international networks. However some disciplines are weaker in this respect.

Recommendations

- International cooperation should be stronger in the section of Biblical Studies and History of Religion and to a certain degree also in the section of Church History, Ecclesiology and Mission Studies.
- The disciplines of Sociology and Psychology of Religion are working together, even though they have slightly different fields of interest. They are embedded in international networks. It is not altogether clear whether there is an intersection of the working together and the international networks or if there is only a union.

16.1.5 Opportunities for renewal and emerging science

General comments

- The number of disciplines could be reconsidered in order to establish a broader basis at the department and to introduce a powerful postdoc programme.
- The way the department is organised reflects to a wide degree the classical disciplines in the programmes of education in theology and religious studies. On the other hand, the department's own suggestions for currently active particularly successful research areas and the most promising future research directions reflect only in a very limited way the division into disciplines. The panel suggests that the department considers thoroughly the organisation into disciplines and secures strong and committed interdisciplinary cooperation in the department and with relevant partners in other disciplines outside the department (social sciences, sociology, peace and conflict research, anthropology, history etc.)
- The panel proposes that the section of Biblical Studies should initiate a thorough process of renewal and formulate ideas for research and programmes of PhD education for the future.
- The methodology in the 'World Values Survey' and the methodology in the project regarding 'Welfare and Religion in a European Perspective', which is to be followed by the project 'Welfare and Values in Europe', need a clarification. There ought to be a clearer picture of the methodology involved in quantitative and qualitative studies if common research is to be successful.

The panel's opinion on most promising future research directions

The list of the most promising research directions given in the self-assessment of the Faculty of Theology consists of ten different themes (listed in A3). The suggestions are very unequal. Some of them are more individual projects, whereas some of them are group projects or even wide international project plans. They also vary in the respect that some of the project plans are based on previous studies conducted at the department. Others are innovative ideas still at a rather early planning stage. The panel would have welcomed more elaborated research plans. However, in some cases, additional information was provided during the site visit.

The panel has been thoroughly discussing the proposals for most promising research directions which the Faculty of Theology has presented in the self-assessment document. During this process the panel has taken into account all the additional information that was given during the discussions with the academic staff in the different sections. As a result of these considerations, the panel would recommend the Faculty of Theology that the following three

most promising future research directions should be further promoted. The panel has not ranked them in any order of priority:

- Contemporary Biology, Media and Worldview Formation
- The Impact of Religion: Challenges for Society, Law and Democracy
- Religion, Peace and Conflict Research

The panel also wishes to encourage the Faculty of Theology to further develop plans for research in Didactics and Pentecostal studies. These areas are interesting and promising although the proposed projects are at an earlier stage of planning than the three projects mentioned above.

16.1.6 Actions for successful development

Recommendations

- The Faculty of Theology should further strengthen the effort to establish research groups and to a lesser degree depend on individual research.
- The panel acknowledges the value of interdisciplinary projects with a perspective on present demands and interests. However, this can not substitute fundamental research in the basic topics.
- To further develop the *PhD education* the panel suggests:
 - More active guidance and supervision and introduction to academic life.
 - More structured study programme in accordance with the demands of an education more than the individual work very much dependent on one or two supervisors with one main goal: to write a book.
 - Training for the situation after the dissertation.
 - To create PhD courses on common themes relevant for all PhD students.
 - Secure critical mass in the PhD seminars.
 - Secure teaching experience for the students and pedagogical training.
 - Include PhD students in the development of projects for the future.
 - Secure that the PhDs are prepared for working in a wider context than Sweden.
 - Include PhD students in work in research groups.
 - Stronger strategic planning in order to include PhD students in research programmes.
 - Courses in university teaching as well as opportunities for teaching should normally be a part of the PhD programme.
 - The second supervisor could be brought in from other disciplines, faculties and universities, even from abroad. Such ex-

change of supervision between universities or departments could be organised on a mutual basis.

- Because the resources are limited, new initiatives are needed to make research and supervision of research students effective. For instance, the panel encourages the Faculty of Theology to start closer cooperation with other theological faculties in other countries. New initiatives have recently been made on a Nordic level in this direction. Joint training of PhD students between different countries and faculties of theology could not only make the level of research higher, but also enable faculties to start joint research projects with external funding.
- The Faculty of Theology has produced a report with suggestions for the future of PhD education (*Pedagogisk utvecklingsprojekt för forskarutbildningen*, Uppsala 2004). The panel acknowledges many of the ideas in this report, and we believe that they constitute a sound basis for improving the PhD education. One of these ideas is the formation of Graduate Schools, in cooperation with other faculties of theology.

Age structure of the department

Statistics reveal that the average age of the senior researchers is rather high. Therefore, a major generation shift is already ongoing. This opens for a possibility for the department to reorganise the structure of its disciplines. We acknowledge the ongoing efforts in this direction. However, it is also in the future of great importance to maintain the identity of the Faculty of Theology as a complete faculty in its classical meaning. This requires that all classical theological disciplines are represented in education as well as in research.

Recommendation

The panel has become aware that the Faculty of Theology has a very limited number of younger researchers at postdoctoral level. A larger number of young scholars is important for the future competence of the department. We strongly recommend efforts to recruit a larger number of *postdoctoral scholars*. When it comes to the recruitment of PhD students, the panel is also of the opinion that the department should not be satisfied with the resources available through government/university funding. A wider scope of externally funded research projects involving young scholars should be strongly encouraged.

16.1.7 Other issues

Recommendation

In its presentation of finished and ongoing research the Faculty of Theology has placed strong emphasis on the research produced by PhD students. The production of PhD students is considerably high, well spread into nearly all the disciplines and the average age of the students is fine. We would like to

emphasise, however, that the PhD education to a large extent is to be viewed as a training programme leading to becoming a researcher. We recommend that there are given more effort to research production by those who have finished their PhD education through establishing a strong and ambitious *postdoc programme* for the best and most brilliant PhDs from at home and abroad.

17. Panel 12

17.1 Department of Mathematics

17.1.1 General assessment

The Panellist Prof. I. Moerdijk did not participate in discussions involving mathematical logic.

The Department of Mathematics (*Matematiska institutionen*) at Uppsala University has a long tradition of very high-level research. Clearly a university of Uppsala's standing and history has to have a strong mathematics department.

However, the Department is presently in a critical position. The activity in parts of the Department is seriously obstructed by personal conflicts. While the situation within the Department is grave, it is not without hope. Several of the younger researchers seem to be little affected by or involved in the conflicts within the Department, while at the same time they are doing outstanding research.

The basic idea of management seems to be that important decisions must be based on consensus among senior personnel. This mode of operation easily leads to non-committal decisions or inconclusive discussions. In particular, the Board of the Department lacks legitimacy in important matters. The current *Prefekt* is doing a heroic effort to keep the Department together and move on. However, the internal structure of the Department makes the task very hard. The Panel is surprised by the lack of a strategy for the Department, including an explicit plan on how to focus the research when replacing scientists upon retirement, and a plan on how to attract more outside funding.

The current group structure is very weak. One reason is that several of the groups lack leadership, and their structure is to a certain extent decided by underlying personal conflicts. A situation where the groups have no financial responsibility, and the researchers bring their own funds to the group, further weakens the structure of the groups. The gender balance is weak.

The Department has not been able to secure substantial external funding. In particular, currently the Department is not directly involved in EU Networks, nor has it been successful with a Linnaeus application.

17.1.2 Quality of research

The quality of research is internationally respected in several areas, including analysis, probability theory, mathematical logic, algebra, and geometry.

Moreover, the Department is making a notable effort to develop new fields of research including applications of mathematics, e.g., in biosciences.

Beyond these some specific areas stand out:

- The research of S. Janson includes several disciplines and is clearly on the very top level internationally, and he occupies a unique position within the Department.
- The group in analytic number theory is doing top-level research. The group has a good blend of experience and young talent with an excellent international network.
- In spite of recent changes in its composition, the group in topology maintains research at a top level internationally.
- There is international high standard research in dynamical systems with the potential for applications in several areas, including promising perspectives in biomathematics.

17.1.3 Research environment and infrastructure

In several areas the age structure makes it necessary to reflect and take decisions on the future focus areas of the Department. A careful plan for the replacement of senior scientists has to be worked out. The number of postdoctoral fellows and research assistants (*forskarassistenter*) is surprisingly low for the Department. There is an active culture of research seminars, but they seem somewhat fragmented. The research at the Department is subdivided in a very detailed way into small groups, and this structure does not enhance cross-fertilization between subdisciplines. Furthermore, this structure makes it considerably harder to obtain major grants.

17.1.4 Network and collaborations

Mathematics is by nature an international activity, and we find that the active researchers have excellent networks, both domestic and internationally, leading to fruitful joint research. However, we find that the Department is barely involved in European Networks; the division into research groups discussed above may in part be responsible for this, and this situation has to be improved.

17.1.5 Opportunities for renewal and emerging science

Mathematics departments at highly ranked universities need to cover essential parts of the basic mathematical disciplines like algebra, analysis, topology and geometry, and stochastics. It is necessary to further strengthen such fields at Uppsala in order to keep up with the standard at other mathematical departments of high reputation.

The present groups in probability and statistics already function together as one of the bigger sections (see below). However, the size of the statistics part

does not reflect the importance of the topic mathematical statistics, and is not comparable to what one finds at most other universities of the same size as Uppsala. Therefore we recommend that the next vacant chair in this section be filled with a statistician. An increase in the number of statisticians would also enable the creation of a valuable consulting service for other departments at Uppsala University and industry.

The group in financial mathematics runs a Master of Science program that is successful with a large number of students, and an expansion of the scientific staff is overdue. The expansion should come in classical core areas of financial mathematics such as arbitrage theory, interest rate theory, econometrics, etc. It should be noted, however, that it is currently hard to find good candidates for academic positions in these areas. A closer interaction with the stochastics section is desirable. The interaction with the Division of Scientific Computing should be continued.

The area of nonlinear partial differential equations is clearly underrepresented at the Department. In particular, for the successful development for the Center for Applied Mathematics (to be discussed below) and the interaction with the Division of Scientific Computing, it is important to strengthen the competence in this area.

17.1.6 Actions for successful development

The Panel urges the University to look into the organizational model for the Department and implement a clearer structure. It is important that one creates consistency between the informal and formal bodies within the Department. In particular, this applies to the Board. It should seriously be considered to employ a *Prefekt* from outside the Department for a temporary assignment until the situation has stabilized.

A carefully crafted plan for the replacement of senior professors has to be worked out. It is important to ensure the continuation of the research areas that were listed above as being on a high international level.

It is necessary to restructure the research activities into sections that are larger than the current groups, each with a more stable composition and with a strong leadership. It should be the ambition of the Department to be more actively involved in European grants. Success here requires a concerted effort involving focused research sections enjoying strong leadership. The research sections should be constructed with that in mind. In the present situation, the Panel recommends that research in analytic number theory and topology be made the cores of two of the future research sections, in addition to the stochastics section mentioned above. The research in the section of topology could be expanded to include parts of complex and algebraic geometry, and explore their natural relations with theoretical physics.

Several of the junior faculty show excellent promise, and it is important that their working conditions are made sufficiently attractive for them to remain at Uppsala University. The new structure with sections should support this goal.

The Panel recognizes some problems that are not restricted to mathematics and are well-known and documented in other evaluations of Swedish research:

1. The introduction of promoted professors has generated a series of difficulties, making the promoted professorships less attractive positions. This will gradually reduce the competitiveness of Swedish research. Their teaching load should be substantially reduced and their salaries should be increased noticeably upon promotion. Moreover, the Panel recommends that chaired professors be involved in teaching at a level comparable to what one finds at prestigious research universities in other countries.
2. Lectureships with very high teaching load are too common in the Swedish system. To improve the situation of young scientists, the Panel suggests a stronger focus on Postdoctoral Fellowships and Research Assistantships (*forskarassistenter*). Such positions will enable young researchers to qualify for positions as researchers, and such positions should be regarded as a part of the educational system for researchers. In addition it will improve the quality of research.

17.1.7 Other issues

Forskarskolan i matematik och beräkningsvetenskap (FMB) is a collaboration between Uppsala University, Karlstad University, Mid Sweden University, and Mälardalen University. The purpose of FMB is to promote cooperation between participating universities and between fields within mathematics and computing. The present goal is to educate 25 PhDs before the end of 2007. The FMB appears to be well organized, and the financial support provided by the FMB is extremely important for the Department. It plays a vital role in the recruitment to research positions in mathematics. The FMB will be evaluated separately, and the Panel will therefore not go into any details concerning this part of the Department.

The Center for Applied Mathematics

See also the evaluation of Division of Scientific Computing

A first-rate university should have a first-rate department of mathematics, and a first-rate mathematics department should have the strongest possible connections to groups applying mathematics at the university. An attempt to facilitate closer collaboration between mathematics and related fields has resulted in a proposed Center for Applied Mathematics at Uppsala University. Unfortunately, the Center appears to be based on rather vague ideas, and the

funding of the future activities remains unclear. In fact, the center does not exist at present.

The Panel acknowledges the need for a unit focusing on applications of mathematics and computing, and the Panel urges the University to put together a well-qualified and broadly based committee that can address this issue. The mandate for such a committee must be clear and include commitments as to the funding of the Center by the University.

From the Department of Mathematics, the promising activity of D. Sumpter must form the basis of a biology part in such a Center. It is likely that this activity will attract both students and external funding. However, this field of biomathematics is too narrow to form the core of the Center. In particular, the Center should include a strong activity in financial mathematics, which attracts many students, and appears to provide good opportunities for external funding.

Modern applied mathematics relies to a large extent on computational mathematics. The Center must therefore have the closest possible relation to the Division of Scientific Computing; for instance, to the research group Waves and Fluids and the activity in numerical finance. In addition, collaboration with other departments should be explored.

The Panel acknowledges that the Department of Mathematics would benefit strongly from such a Center. The composition of the Center must be such that it strengthens all participants. For example, from the side of the Division of Scientific Computing there is a strong desire to collaborate with mathematicians in the field of analysis and solution of nonlinear partial differential equations, since such equations often constitute the very cornerstone of applied problems. The Panel suggests that this field be strengthened in the Department of Mathematics and that this activity be integrated in the Center.

The Panel suggests changing the name of the Center to *Center for Applied and Computational Mathematics*, making it more consistent with the suggested scope of the research activity. The choice of the Head of the Center should reflect this broader orientation.

Finally, one should consider the relation between the *Forskarskolan i matematik och beräkningsvetenskap* and the new Center for Applied and Computational Mathematics.

17.2 Division of Scientific Computing

Evaluated by Panel 12; other divisions were evaluated by Panel 18

17.2.1 General assessment

The Division of Scientific Computing (*Avdelningen för teknisk databehandling*, TDB) is a part of the Department of Information Technology. The Di-

vision counts 22 faculty members, and the activity appears to be very well organized. The research is divided into five groups; Applied Numerical Linear Algebra, High-dimensional Problems, Software Aspects of High-Performance Computing, Uppsala Computing Education, and Waves and Fluids. All groups appear to be active internationally.

The Panel was pleased by the well-prepared presentations given by the staff members. The Division has a clear strategy; the research is directed towards challenging and important applications often motivated by scientists outside the department and from industry. The Division is very active and willing to explore new ways to establish research cooperation with other groups. The Panel was impressed by the initiative to create a computing consulting activity run by the students.

The Division is well positioned in the emerging field of computational science. Internationally, this field is growing, and it is undoubtedly important for almost all of science. The Division is ambitious, and there is a great potential for landmark results based on their methods and software applied to problems defined together with their collaborators. The gender balance is good.

17.2.2 Quality of research

The overall impression of the research is that it is of internationally high standard with elements of top-level activities. Furthermore, there is a possibility of reaching a world-leading position on a broader basis. The Panel is pleased to see that the Division is deeply involved in real applications of their methods and software, and the Panel urges the Division to continue this line of research.

The Panel observes that good results have been obtained using rather classical methods. In addition, new methods have been investigated (software, parallel computing, adaptivity, multiscale analysis). However, other fields of major progress in scientific computing are not present in the Division. The Panel suggests that the Division should explore methods suitable for large-scale computations addressing realistic models defined on complicated geometries. In particular, realistic models of nature defined on complicated geometries should be addressed.

17.2.3 Research environment and infrastructure

Both the research environment and the research infrastructure appear to be excellent. The Division is involved in *Forskarskolan i matematik och beräkningsvetenskap* (FMB), and it is the focal point of several Swedish research initiatives.

17.2.4 Networks and collaborations

The Division is well connected to other groups at the University, to SLU, KTH, groups in industry, and to international research groups, in particular at Stanford University. It is currently heading the Linnaeus proposal *Future Simulation and Design Tools in Science and Engineering* jointly with KTH.

17.2.5 Opportunities for renewal and emerging science

The Division has identified the following areas as opportunities for renewal and emerging science:

1. Multiscale analysis, modeling and computation
2. High-dimensional problems
3. Design optimization and inverse problems

These fields are both promising and important, and it is well documented that the Division can make serious contributions to these fields.

17.2.6 Actions for successful development

The activity in the Division is hampered by the fact that the funding situation has been difficult after the PSCI project terminated. The Division is presently preparing an application for a Linnaeus grant; the application involves world-leading researchers at Uppsala University and KTH. The Panel recommends that the University strongly support the application. Funding is critical for further development of this successful and well-organized activity. If granted, it may constitute a core part of the Center for Applied Mathematics (see below).

17.2.7 Other issues

The Center for Applied Mathematics

See also the evaluation of the Department of Mathematics

Modern applied mathematics relies to a large extent on computational mathematics. An attempt to facilitate closer collaboration between mathematics and related fields has resulted in a proposed Center of Applied Mathematics at Uppsala University. Unfortunately, the Center appears to be based on rather vague ideas, and the funding of the future activities remains unclear. In fact, the center does not exist at present.

The Panel acknowledges the need for a unit focusing on applications of mathematics and computing, and the Panel urges the University to put together a well-qualified and broadly based committee that can address this issue. The mandate for such a committee must be clear and include commitments as to the funding of the Center by the University. The scope of the Center should be made broader. In particular, it should include nonlinear partial differential equations, since such equations often constitute the very cornerstone of applied problems. This would make it possible to include, for instance, the

group Waves and Fluids and the activity in numerical finance in the Center. Thus, it is important that the area of nonlinear partial differential equations also be strengthened at the Department of Mathematics.

The Panel suggests changing the name of the Center to *Center for Applied and Computational Mathematics*, making it more consistent with the scope of the research activity. The choice of the Head of the Center should reflect this broader orientation.

Finally, one should consider the relation between the *Forskarskolan i matematik och beräkningsvetenskap* and the proposed Center for Applied and Computational Mathematics.

17.3 Centre for Image Analysis

17.3.1 General assessment

The Centre for Image Analysis (*Centrum för bildanalys*, CBA) was established 18 years ago and is presently a well-organized research unit of about 30 persons. It is a joint research entity belonging to both Uppsala University and Swedish University of Agricultural Sciences (SLU). The centre focuses on interdisciplinary research founded on discrete mathematics, image analysis and synthesis, and computer science with primary applications in life sciences, and secondary ones in forestry, paper structure, and remote sensing.

The Panel was pleased to observe a good gender balance at the CBA.

17.3.2 Quality of research

The work of the CBA is based on two methodological choices, namely the decision to view space and time in a discrete manner, and the combination of the two approaches of image analysis and image synthesis for applications that require both.

In applied mathematics, quality cannot be estimated by the theoretical innovation alone, but rather by the matching between theory and specific applications, and also by the robustness of the results. For example, in biology the methods must be insensitive to individual variation and to staining. Clearly, these aspects are well mastered at CBA.

The Panel is very impressed by the well-prepared presentations by the members of CBA. The CBA is publishing its results at a steady rate in high quality international journals and good conference proceedings; it is important to keep up and strengthen this rate.

The research at CBA holds a high international standard, as witnessed by the quality of its publications.

17.3.3 Research environment and infrastructure

Computer facilities and the research environment seem excellent. The teaching load is adequate. The CBA is well positioned for coming into contact with interesting and challenging research problems from many areas.

17.3.4 Network and collaborations

The CBA participated actively in the creation of the International Association for Discrete Geometry for Computer Imagery.

Important research partners come from medical sciences and industry producing medical equipment. The collaboration with the forestry and paper industry is important for Uppsala University and SLU, and it demonstrates direct applications of the research in industry. The CBA is successfully facing the strong international competition.

17.3.5 Opportunities for renewal and emerging science

A major opportunity for CBA is the regrouping of remote sensing and GIS activities at CBA. It also provides an additional orientation for CBA, in the direction of time evolution and multi-spectral problems.

The Panel finds that CBA may play a key role in a larger effort initiated by research groups in the life sciences. The CBA should play a role in the future of the Center for Applied Mathematics.

17.3.6 Action for successful development

The Panel recommends that the CBA should intensify its relations with groups in discrete mathematics and scientific computing. The strong focus on medical applications has been successful and should be maintained. Furthermore, the combination of techniques from image analysis and image visualisation should be pursued further.

The Panel recommends that the CBA receive increased funding for permanent researchers; the number of permanent staff is too small compared to the high number of temporary staff.

18. Panel 13

18.1 Physics and Astronomy

18.1.1 Overall comments concerning Physics and Astronomy

General assessment

Physics and astronomy have a long and distinguished history at Uppsala, including two of the University's six Nobel prizes, and the most recent one, to Kai Siegbahn in 1981. Our review finds this tradition of excellence to be continuing today, over a highly diverse set of forefront research areas encompassing string theory, nuclear and particle physics, astronomy and astrophysics, energy-related research, advanced spectroscopy and synchrotron radiation research, nanoscience and new materials development, theoretical modeling of materials, and research in the teaching of physics. We are concerned however, that the recent decreases in funding for the research universities in Sweden, and for Uppsala in particular, is threatening the maintenance of this tradition, as we elaborate below.

At present the physics and astronomy activities are, largely for reasons of historical development, divided into five different departments: Theoretical Physics, Nuclear and Particle Physics, Neutron Research, Astronomy and Astrophysics, and Physics (Fysikum), with the last involving theoretical and experimental atomic, molecular and condensed matter physics and synchrotron radiation experimentation. There are about 250 people in total in the five departments. In a given year, about 500 fulltime-equivalent students are taught in these five departments, with this number being constant to within ca. $\pm 5\%$ since 2000.

Some idea of the present relative sizes of these five departments is provided in the Figure 18.1 below, where we compare the total number of employees, the number of graduate students, the revenue level, and the number of publications for a recent year as indicated and available to us, as well as the number of highly competitive young faculty grants which essentially lead to a tenure-track future from the Swedish Research Council and the Royal Academy of Science since 2000. In this last category of young faculty grants, the physics and astronomy departments in Uppsala have received 9 of the 49 granted to the University as a whole, or more than 1 in 6, an outstanding record. These and other numerical summaries given to us, as well as the detailed review that we have made, make it clear that these departments are very active in research, and furthermore that physics as a whole is still very much in the vanguard

of Uppsala research on an international scale. These plots also indicate that the Physics Department (Fysikum) represents about one half of the activity at present by any of these measures.

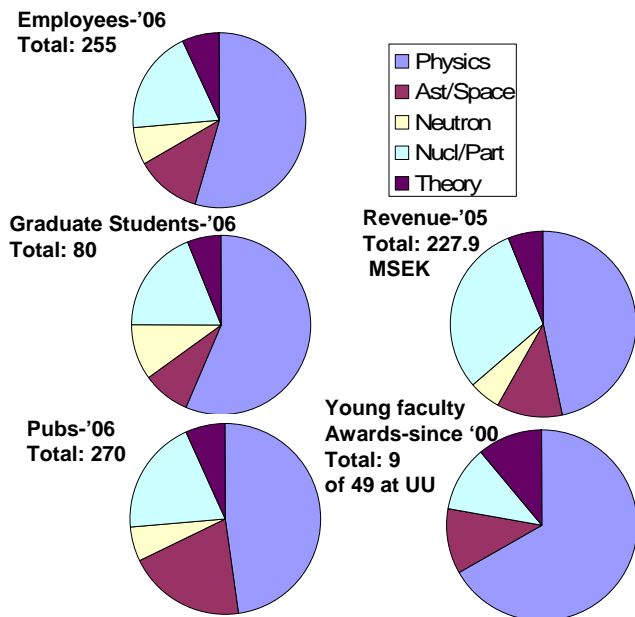


Figure 18.1: Comparison of the current five departments in physics and astronomy at Uppsala, based on total personnel (including graduate students) in 2006, graduate students in 2006, total revenue in 2005, total publications in 2006, and young faculty tenure-track awards from the Swedish Research Council (VR) and the Royal Academy of Science (KVA) from 2000 to the present.

We present our evaluations of these five departments in separate reports in the same format below, but in what follows in this section make general comments that relate to repeated observations that pertain to all the departments, or in a few cases more broadly to the general environment for physics research in Sweden.

Quality of research

There are several world-class or internationally recognized research activities in physics and astronomy in Uppsala and we have commented on them in the discussion of the specific departments below.

Research environment and infrastructure

We find it most positive that all of physics research is located in close physical proximity in the Angström Laboratory. This laboratory is a unique resource that the University should support fully. However, we note that physical proximity does not necessarily lead to interactions, and we thus urge the senior faculty members to actively promote further interactions and exchanges of

ideas. These interactions would be enhanced for example by having a Physics and Astronomy Colloquium in which speakers from all branches of the field would give more general talks, and we understand that this has in fact recently been initiated. Uniting physics activities in two departments, and finally in one department, would further enhance this.

Networks and collaborations

In general, the various physics research groups are highly interactive both within Sweden and in the international community, with specific discussions below.

Opportunities for renewal and emerging science

We saw a number of excellent junior faculty, postdocs, and graduate students. We also met with the representatives of a relatively new organization representing the junior scientists at UU, and we strongly support the creation of this advocacy group.

Actions for successful development

–Organisation: We strongly support the merger of the five departments into two consisting of Fysikum and the other four, and we also consider that this should be followed soon by a complete union of the five departments. The final merger would create a department of about 250 people, which is not large compared with physics departments in the U.K., Germany or the U.S. of similar activity and breadth. We consider that this merger would have the following advantages

- It would improve the coordination between different groups in physics which are doing similar work but are for historical reasons in different departments. Examples are the two groups doing energy-related research and the two doing theory related to high energy physics, for which we consider that increased collaboration is important in the future.
- It would be possible in one department to arrange the teaching duties in a fair and consistent way across the whole faculty without biases related to past history.
- It would improve the teaching if the courses were not restricted to particular departments but were seen as an overall physics course and planned with that intent.
- If decisions need to be made about priorities in research or teaching, they could be made in the interests of the whole of physics and astronomy, rather than in the current situation in which it any such overall planning is not possible.

–Gender representation: Several talented young, female scientists presented the research projects of their groups in a excellent manner. We also note positively one female department chair and a recently-appointed female full pro-

fessor. However, the number of women in permanent faculty positions over these five departments is still quite low, presently 3 of 43 (7%) at full and promoted professor level as compared to 6 of 40 (15%) at the postdoctoral level and 23 of 80 (29%) at the doctoral student level. This last number can be compared to the percentage of PhD examinations in physics completed by women in Sweden as a whole, which averages 19% over the last six years. Thus, Uppsala physics appears to have a higher fraction of female PhD students than the national average. The larger portion of female scientists at postdoctoral and doctoral student levels provides a basis for recruiting well qualified permanent female faculty. The committee recommends that the university seek to increase the number of female faculty in the area of physics in the coming years. Questions were raised as to what would be a successful strategy in this respect. For recruitment to faculty positions, we believe that fully funded faculty positions covering both research and teaching, as discussed below, would make the working conditions at the university more attractive, in particular for female researchers. More well defined career paths to permanent positions (also discussed below) are also expected to be more attractive to female candidates.

–Facilities for advanced instrumentation: Physics is an experimental science in which the most important measurements are usually made with sophisticated, one-of-a-kind instruments. We thus most strongly support the idea described to us of a Center for Accelerators and Instrumentation (CAI), perhaps renamed Center for Advanced Instrumentation (also CAI), which we feel would capitalize on a strong tradition in Uppsala for developing advanced measurement tools (which in fact directly led to the last Nobel Prize in Physics here), but also represent renewal as we look at the very talented people who are involved in the various instrumentation-oriented projects that are presently underway or planned here. The physics and astronomy community here is still clearly a leader in many areas of forefront instrumentation, and the technical resources and personnel (e.g. electronic and mechanical engineers and technicians, project managers) available for designing and building such devices have been seriously reduced over the past decade or two. Beyond this, we note a special Swedish situation in that it does not have the equivalent of the Max Planck Institutes in Germany, the CNRS or CEA laboratories in France, or the national laboratories in the US in which such highly specialized equipment can be built. We thus feel that the CAI, if properly staffed with an adequate number of permanent personnel, could put UU into a situation of providing a unique resource for the country as a whole.

–Computation facilities: The panel would also like to underscore the importance of developing an adequate computing infrastructure. There are many activities in the departments which depend critically on the access to powerful computational resources. These activities include, for example, the data-intensive research in experimental high-energy and astrophysics, as well as the computer-intensive research in materials modeling. Computing infrastructure

should be developed as a hierarchical facility, where local resources, departmental services, nationwide and international grid-type solution are in balance. The eventual merger to a single Physics Department would facilitate the cost-effective buildup of such a “computational pyramid”.

–Teaching: For reasons that are in some cases related to problems with the funding of research and junior faculty positions within the university (see further discussion below), we found the teaching load to be highly non-uniform over the various departments, as well as over senior to junior faculty in different categories. We urge that attempts be made to make this more uniform and fair, again something which should be easier at least administratively if the departments merge into two and then one (see above). As one reference number in this context, the almost canonical teaching load in the sciences in a research-oriented U.S. public university is 3 lecture hours per week, plus some minimal laboratory or seminar supervision.

–Breadth of activity: Although we were in general impressed with the breadth of high-quality research projects and areas presented to us during this review, and by what is being accomplished by relatively few people per project in some cases, we are concerned that in some areas the efforts may be spread over too many areas relative to the staff and funding available, and we would urge the individual departments, or the merged department(s), to carry out prioritizations within their various projects so as to maximize overall impact if resources are, or in the future become, too limited to excel in all areas. This concern is related to the comments we make below on the general level of university and research funding in Sweden, which we hope will improve; however, if it does not, then some prioritization may be necessary.

Other issues - within the University

–Undergraduate research access: As a general educational item, we recommend increasing the possibility for undergraduates to become familiar with research in physics, and to be able to get involved in some way in projects during this period of their education. Several graduate students mentioned this to us as the only thing they would change in an otherwise very positive experience in Uppsala. We understand that Physics–Fysikum has initiated such a program and would urge the other departments to consider it as well.

Other issues - at the combined University and national level

–Research funding and young faculty career opportunities: Although we have been impressed with the outstanding research carried out in many areas of physics at Uppsala, we believe that funding cuts in general to the research universities in Sweden over a number of years are very close to creating a crisis in physics research and graduate education. Primarily this has affected the situation for personnel, who must function in a highly variable situation of support between teaching and research, with some people teaching more and some teaching less, but an expectation of quality research productivity from

everyone if they expect to advance in the system. Such partial funding, which varies from year to year depending on the individual researcher's ability to attract funding from external sources, combined with the fact that there does not appear to be a clear enough picture as to what does and does not lead to some sort of tenure-track position in the university leads to great personal insecurity, and to the loss of some very talented people who otherwise might have chosen an academic career. One desirable alternative would be that a person is fully funded by either the university or by some funding agency, but not by both, and that university-funded personnel all teach at the same percentage, which is low enough to carry out first-class research. This option suggests that, to the extent that faculty funding will be increased in the future (as we sincerely hope it will), the additional funds should not be used primarily to add new positions, but rather to regularize the way faculty members are funded. Grants would not then be used for salaries for faculty, but could be used to hire personnel for temporary employment like post-docs or graduate students. Overall, this is essentially the way the system operates in the U.S., as well as in some other European countries. At present, the Swedish system seems to be in a transition state from the former hierarchical structure with a full professor in charge of many subordinate researchers to one in which all professors (full and promoted) will be more equal in teaching and research requirements, even if not in salary. Future hiring should thus take this desirable evolution into account.

There is also an imbalance in the Swedish system in that many more people are recruited into the research assistant (*forskarassistent*) or "assistant professor" positions than can be accommodated with long-term security of employment at the Promoted Professor or Full Professor level. The current four-year duration of these positions is also too short to properly establish an independent research program and be certain of graduating at least one PhD (the minimum requirements for advancement to the next level). Raising the duration of these appointments to six years, as we believe is being discussed, would help with this particular problem. But as it is, many of the most talented young people are leaving scientific research and the academic world because of the combined difficulties we have outlined in the last two paragraphs. Overall, we believe that more permanent positions are needed within the Swedish university system in order to provide a clearer career path for young scientists, and that, if necessary, this may have to be at the expense of reducing the number of research assistant positions. Finally, we believe that research assistants should also automatically be provided with some funds for graduate students, since they otherwise will not be able to establish their program in the time allocated (even if this is raised from 4 to 6 years).

–Technical support staff: A different group of personnel that has been severely decreased over many years of decreased university funding is permanent-staff research engineers and technical personnel. The sophistication of modern physics research equipment implies that graduate

students or faculty cannot in general take on these duties at a sufficiently high level and/or that if they are forced to do this, their time for creative research is seriously reduced. To the extent that there are resources for new permanent recruitments, special attention should be paid to reestablishing the access to this type of technical personnel, with the Center for Accelerators and Instrumentation representing just one place in which this is essential.

–Funding for instrumentation and personnel: In general, it appears that, at the national level, it is easier to get funding for instrumentation purchases or development, but harder to get funds for the personnel required to take advantage of it. This can lead to subcritical groups with excellent equipment but not enough personnel to carry it to the desired impact. This issue also needs to be addressed at the national level.

–Funding for international projects and major national facilities: Finally, it is very positive that the Swedish Government supports the participation of its physicists in various international projects in which the Departments of Nuclear and Particle Physics, Astronomy and Space Physics, and to a lesser degree Physics-Fysikum are involved (e.g. at CERN, FAIR, ESA, ESO, ESRF, and other organizations, as discussed in the individual sections of this review), and we hope that such support continues. On an issue of more directly national relevance, we also sincerely hope that the Max IV synchrotron radiation facility will soon get final approval for construction, as it is key to the continuing excellence of many research activities in the Physics-Fysikum Department, which is in addition deeply involved in its planning and construction. This facility is also key to the continuation of Swedish excellence in this type of research, as carried out at several institutions in the country. In this last context, we further hope that the significant Swedish contribution promised in a proposal for the European Spallation Source for neutron research does not negatively impact the decision on building Max IV, especially since Sweden has a much greater history of achievement and involvement in synchrotron radiation research. Nonetheless, if both of these can be realized in the future, the complementary capabilities offered by the combination of MAX IV and ESS would constitute a world-unique center for structural research in the physical and biological sciences which in the last generation of such facilities only existed in Grenoble with the ESRF and ILL.

18.2 Department of Theoretical Physics

18.2.1 General assessment

This is a very strong group working on various aspects of string theory and gravity. High quality results are being obtained despite a heavy teaching load. The research is mainly focused on formal and mathematical aspects of the theory but also on possible applications in early cosmology and black hole

physics. Particular areas of activity include gauge theory-gravity duality (AdS/CFT correspondence) and integrability, supersymmetric gauge theories and complex geometry, cosmological applications of string theory, and more recently spin-chains and spin-charge separation as seen first in condensed matter physics but now considered with respect to high-energy physics.

18.2.2 Quality of research

Results obtained in this group on gauge theory-gravity duality were a world-leading theoretical breakthrough with enormous impact, a forefront achievement in string theory research. They were based on a novel idea of applying the techniques of integrability from two-dimensional systems to four-dimensional gauge theories that led to the first non-trivial test of the AdS/CFT correspondence. This duality is one of the most influential results in theoretical physics research during the last years, with far reaching consequences varying from the theory of strong interactions, to new models of particle physics and unification of fundamental forces, to radical ideas of how gravity is realized in nature, going up to the resolution of the information paradox problem in black holes.

In addition to this work, other first rate results with international impact were obtained in all areas of research activity, and highly cited papers have resulted.

Finally, we also note outstanding theoretical work in the Department of Nuclear and Particle Physics on high-energy phenomenology that is related to one of the future directions of development in this department.

18.2.3 Research environment and infrastructure

There has been an important evolution of the faculty in recent years. Several professors were hired but left after a few years stay, while others may be in the process of moving. Of course, it is one sign of high-quality staff that they are also attractive to other institutions, but one factor could be that the teaching load of this department is too high compared to that of its competitors. But whatever the reasons, it is important for UU to address this loss of excellent people in order to maintain the high quality of this department. The issue of teaching load as related to faculty retention is also one that should be addressed during the coming merger of several physics departments into one.

18.2.4 Networks and collaborations

This department has excellent international collaboration and interactions.

18.2.5 Opportunities for renewal and emerging science

The junior faculty activities are world class.

The interactions with the Nuclear and Particle Physics Department (high-energy experiment and experimentally-oriented phenomenology) are at present minimal, basically at the level of graduate courses. In the new physics department after the merger, it would be good to consider a larger theory group covering the whole spectrum of high-energy theory, from phenomenological applications of QCD, to physics Beyond the Standard Model, string theory, cosmology and gravity, with this including closer contact and more collaboration with the UU experimental groups.

18.2.6 Actions for successful development

The Department is recommended to pursue current hires of two additional faculty positions (lecturer/professor), with a recommendation that these hires not only enhance the present research areas, but also open up directions related to phenomenology that are more closely linked to experiment and the UU experimental groups.

18.2.7 Other issues

Doctoral/post-doctoral training seems excellent. PhD graduates, former post-docs have no problem finding the next position, either in academia or in industry (about 50

18.3 Department of Nuclear and Particle Physics

This is a multifaceted but coherent program that we split for detailed evaluation and discussion into two groups: nuclear physics and particle physics. We also comment at the end of this assessment on another type of effort involved with predicting energy resources into the future.

The nature of the experimental work in nuclear physics and particle physics (high-energy physics) requires working at various large-scale international facilities with specially-designed instrumentation, and this department is involved in first-rate experiments in several world-leading programs. Data handling also involves extraordinarily large sets which must be sent to many institutions at high speed and then analyzed with specially constructed computing clusters or supercomputers, and again the Uppsala efforts in this aspect are very strong.

18.3.1 Nuclear Physics

General assessment of the group

Present-day nuclear physics works on the low-energy frontier of what is termed quantum chromodynamics (QCD), where a phase transition occurs in which quarks are confined as hadrons, with the most obvious examples being the protons and neutrons which form the nuclei, and these in turn with their companion electrons make up the main part of the visible matter in the Universe. In hadron spectroscopy, one seeks to understand the origin of the high mass of the hadrons, which are composed of nearly massless light quarks and the nature of the phase boundary in such strongly interacting matter by exploiting a variety of methods worldwide. The nuclear structure physics carried out by this group also aims at studying heavy nuclei far off the line of observed stability, as e.g. are involved in various stellar nuclear synthesis processes, using radioactive beams and advanced spectroscopy methods, such as high resolution γ -spectrometers.

The present program in nuclear physics at UU is focused on a few top-quality projects in hadron physics and nuclear structure research which we find to be coherent and logically sequential in time involvement. The Wide-Angle Shower Apparatus (WASA) experiment, formerly at the Celsius facility in Uppsala, is being moved to the Cooler Synchrotron (COSY) in Juelich, and this represents a well chosen, low-cost opportunity for research of a high international standard. In addition, collaboration in world-leading programs in hadron and nuclear structure physics will follow with the PANDA experiment in nuclear and hadron physics with stored antiprotons at the future Facility for Antiproton and Ion Research (FAIR) facility at GSI in Darmstadt and the Advanced Gamma Tracking Array (AGATA) detector for nuclear structure physics using radioactive beams at various European facilities such as the large accelerator for heavy ions in Caen (GANIL), the Instituto Nazionale Fisica Legnaro (INFL) in Legnaro and the GSI in Darmstadt. These projects represent excellent exploitation and utilization of previous experience in antiproton physics at the CERN Low-Energy Anti-Proton Ring (LEAR), hadron physics at CELSIUS in Uppsala, and creative technical developments by the nuclear physics group, as e.g. hydrogen-pellet targets and the WASA detector construction.

Quality of research

The hadron physics group at UU took a leadership role in the LEAR program at CERN with world-leading research in meson spectroscopy and the search for QCD exotics such as “glueballs” in low energy antiproton-proton annihilation.

The group has also been involved in internationally high standard studies of meson production near threshold using the CELSIUS storage ring, with

η meson rare decay studies following this, in a project which will now be extended to heavier mesons, such as the gluon rich η' meson at COSY.

For the future, the hadron physics group has joined the PANDA collaboration at FAIR in Darmstadt, with one group member as spokesperson for the precision spectroscopy of charmonium states and the search for QCD exotics, such as glueballs and hybrids. These experiments probe the transition region from non-perturbative low energy QCD with quark confinement and spontaneous chiral symmetry breaking, with this effect creating the large hadron masses of the visible universe, to the perturbative QCD regime involving the well-studied asymptotic freedom of the quarks at high energies. This will become a world leading research project that ideally matches the know-how and experience of the UU group and therefore is very cost effective. Particular contributions of the institute to these activities will be a hydrogen pellet target, participation in the development of high energy electron cooling—an essential feature for high resolution resonance spectroscopy in antiproton-proton annihilation, and a high resolution γ -calorimeter for PANDA.

The nuclear structure group is continuing the development of the high resolution γ -detector AGATA, a European project for the study of nuclear structure far off the line of stability at various European heavy ion beam facilities, such as GANIL, INFL and GSI. This work is on an internationally high standard.

Research environment and infrastructure

The existing infrastructure in terms of the personnel composition is considered as satisfactory, with this including the experience of the in-house experiments with the CELSIUS storage ring, the previous antiproton experiments at LEAR and the ongoing project with the WASA detector at COSY, provided that vacant professor positions will be reoccupied in the near future again with experienced scientists in the field of hadron physics.

The creation of CAI is essential for the support of the anticipated projects by providing first class R&D and construction contributions for the hydrogen pellet target, the high energy electron cooling and the advanced photon calorimeter for the PANDA detector. The transfer of the four collaborators in the high energy electron cooling development from the Svedberg Laboratory to the CAI is also strongly recommended

For data analysis, access to the internationally-based grid computing developments at UU (e.g. ARC and KnowARC) is essential.

Networks and collaborations

The hadron and nuclear physics groups are members of the EU I3 HP and EURONS programs and are preparing similar applications for the upcoming 7th EU framework program. These are excellent, highly rated and well financed European collaborations which are essential for the WASA, AGATA and PANDA projects.

Opportunities for renewal and emerging science

After the closing of CELSIUS, the nuclear physics group went through a drastic renewal phase by taking up the present hadron physics program at COSY and initiating the PANDA project at the future FAIR facility.

Looking ahead, we believe it is of great importance that new positions in accelerator based physics will be retained permanently when key faculty decisions come in 2009.

As noted above, full support for the Center for Accelerators and Instrumentation is absolutely needed.

Actions for successful development

Enhancement of the theory effort in the field of non-perturbative QCD is desirable.

Other issues

We were very impressed with the students and young researchers we met.

18.3.2 Particle Physics

General assessment

This group within the Department of Nuclear and Particle Physics deals with accelerator particle physics and astroparticle physics.

The goal of accelerator particle physics, at the forefront of its energy domain, is to re-create, in a microscopic way, the conditions of the early universe, 10^{-12} seconds or so after the Big Bang. In particular, the LHC (Large Hadron Collider) at CERN will cover the energy domain through which the universe underwent a phase transition and should allow us to understand how the elementary particles acquired their mass. It will test the Standard Model of particle physics by searching for the last as-yet-unobserved particle predicted by it, the Higgs Boson, but this search may also reveal physics beyond the Standard Model. The LHC may also reveal the existence of a mirror population of particles (via Supersymmetry), the origin of the mysterious dark matter in the Universe and perhaps some “large” (but less than a few microns) extra dimensions of space. The ATLAS experiment at the LHC will start data-taking in 2008. The next decade of results will be a most exceptional period for particle physics.

Astroparticle Physics exploits looking at the particle “messengers from the Cosmos” to learn about the history of the Universe and among other things to look for relic particles from the Big Bang. AMANDA and its more powerful follower ICECUBE are large Antarctic sub-ice detectors focusing on neutrino astroparticle physics.

The panel first notes the satisfactory trend in the growth of Swedish high energy physics, both over the country as a whole and in particular at Uppsala, over the past decade or more, and strongly encourages that it continues.

As overall comments, the panel notes these positive aspects of the Uppsala program in particle physics:

- It is pursuing a sequence of programs at forefront machines and detectors,
- It has strongly focused its future on two world-leading research programs, one in accelerator particle physics (the ATLAS experiment at LHC) and one in astroparticle physics (ICECUBE in Antarctica),
- It has made, within these programs, well thought-out choices of activities, which placed UU in strategic sectors of the instrumentation and of the physics analysis,
- It is concerned about long-term developments in particle physics and plays an important role in the accelerator and detector R&D that is essential for this.

Quality of research

The Particle Physics Group at Uppsala collaborates in the world-leading top-quality research projects quoted above, and has a good balance between accelerator particle physics and astroparticle physics. The sequence of their programs is well-focused and coherent. Stepping from D0 at Fermilab to ATLAS and the “adiabatic” evolution from AMANDA to ICECUBE are quite logical and the transition is well managed, allowing the group optimally to exploit the experience previously obtained. The group participates very actively and efficiently in these programs and has seized at best the opportunities to build-up collaborations at all levels inside their large teams. It benefits of a clever, energetic and stimulating leadership, and of the high level of competence of the main actors in each of the subfields and projects involved.

There is a long tradition of innovation and excellence in instrumentation at particle physics at UU. This is being optimally exploited and maintained, both in the experiments and in the R&D programs. We especially underline the importance of CTF3 (CLIC Test Facility number 3), a test set-up of a possible future multi-TeV linear collider CLIC, and the key position of UU in the two-beam test stand, a strategic part of this set-up.

The group has already shown in DELPHI at LEP, in D0 and in AMANDA its strong motivation and its competence in data analysis and physics extraction. The search for the charged Higgs Bosons actually implies the study in depth of classes of events which are also promising for other physics topics, both within the Standard Model and beyond it. The group is encouraged to explore these opportunities.

Concerning past and future physics results, the situation however differs between the experiments in accelerator physics, which have produced (DELPHI, D0) and still offer (D0) a large variety of analyzable and publishable results, and the present experiment in particle astrophysics, AMANDA, which, due to the difficult nature of neutrino astrophysics, must still be considered simply as a well-working prototype for ICECUBE.

Considering the available personnel in this group, one could ask whether its goals are too ambitious. However, as we said, they involve only two long-term programs, to which UU is already committed (ATLAS at CERN and ICE-CUBE in Antarctica). The panel considers they are both highly relevant and promising for the group. Coping with any difficulty in staffing level, if such shows up, could be achieved through a reinforcement of the teams with new scientific staff and a further increase of collaborative activities at the national and international levels.

Research environment and infrastructure

The environment of the Ångström Laboratory seems to be excellent in all respects.

About 25% of the group activity is teaching, which is of high quality, stimulating and well received by the students.

The panel enthusiastically supports the realization of the CAI platform, which will offer to UU a powerful center of R&D and construction, allowing in fact all of the physics departments to take advantage of crucial competencies and ensuring the continuity of staff that is essential for such activities. However extreme care must be exercised in hiring people for CAI, which must become a technical and research center rather than an ordinary workshop. A strong expertise in those aspects of design and construction of accelerator components has to be included in the CAI, while at the same time assuring that it can serve the needs of the other departments in physics and other sciences at UU.

The panel appreciates the remarkable and successful efforts made, especially by this group, in the matter of data handling and computing. This has led in particular to an overall Nordic Tier-1 network representing 6% of the total computing power for the ATLAS experiment, with a node at UU which should insure full access by Uppsala physicists to LHC data. The first ATLAS “data challenges” have shown that this network is most efficient for simulation of data. Grid computing, in general, e.g. ARC and KnowARC, has also been strongly pushed by UU for Sweden and the Nordic countries, in particular within the EU framework.

We finally note that large centers like CERN can be a strong asset in the training and professional development of young physicists and engineers for both research and industry, in that they provide an ideal and challenging international high-technology environment in which to grow. However, an effort has to be made to define and organize such possibilities by the country/institute which wants to exploit this benefit to a maximum degree. We suggest that UU review this possibility from an institutional perspective, and we note that the CAI should be very useful in this respect.

Networks and collaborations

By its nature High Energy Physics, in ATLAS as in ICECUBE, requires a high level of collaboration and networking at a national and international level. It is simply a fact that HEP cannot be done without extensive international collaboration.

In this respect, as we have noted above, the UU situation and attitude are excellent. It has been very successful at building and exploiting all possible synergies inside the experiments. The five Swedish ATLAS groups collaborate closely, under the leadership of UU. The Swedish share of ATLAS investment and population is about 2%, similar to Sweden's share at CERN, ensuring a good visibility of Sweden in the experiment. As another relevant number, the group built and tested about 8% of the microstrip detectors of the ATLAS Inner Particle Tracker.

UU is also particularly active and successful in organizing international events in Uppsala (the worldwide Lepton-Photon Conference 2005, International Charged Higgs Workshop 2006, and CERN Accelerator School 2007).

We have also already mentioned the success of the computing network, and the key role of UU in its implementation. And we also note the potential of CAI to develop multidisciplinary collaboration, e.g. for next-generation detector development for synchrotron radiation research that is a key strength of the Physics Department-Fysikum.

Furthermore the collaboration between experimentalists and theorists in this group is excellent. This is a key asset, in particular to master the analysis and the understanding of LHC physics channels. Whatever be the future structure in UU, this close and fruitful interaction must be kept and in fact strengthened.

Opportunities for renewal and emerging science

The HEP group is not large and should be reinforced, first on the ATLAS side. Currently the research assistant position for ATLAS is being filled. It is also most important to recruit PhD students and postdocs for this project. The Division has just submitted a proposal to the Marie Curie Mobility Actions Initial Training Network. In addition, one should hire at least one post-doctoral researcher for ATLAS (which would then bring to four the size of its research group). The start of LHC physics is indeed a particularly favorable and rewarding period to offer positions to young researchers, in order to get a maximum out of the new data, a possibility that is already being exploited in other countries.

The long-term future of particle physics depends on both the physics results which will be obtained, especially from LHC, and a vigorous continuation of R&D programs in the matter of accelerators and detectors. The UU group is deeply involved in such matters in key sectors as:

- CTF3 for CLIC, already discussed,

- the development of radiation-hard 3D Silicon Detectors, in particular in view of a possible ATLAS upgrade,
- acoustic (and radio) detection of atmospheric neutrino showers for ICECUBE, with these representing the only way to foresee a eventual large increase of its volume in the future. UU has already successfully tested such prototypes, now installed in situ. The panel highly appreciates these activities, already well underway, and to which CAI can bring a decisive boost, provided it is properly staffed.

It is also essential that accelerator physics positions be made permanent beyond 2009.

As far as theory is concerned, the panel recommends that the theorists diversify their work on physics topics beyond the Standard Model that may be related to the experimental searches of the group.

Actions for successful development

These have been mostly covered above, but we reiterate our strong support for CAI, and for moving to hire appropriate younger scientists to enable taking full advantage of the key experiments that will soon start.

Other issues

The panel was very favorably impressed with the younger scientists and students in this group.

18.3.3 Energy Resource Research

Summary

There is also a small-scale activity in this Department on energy resource research, as for example, predicting when the world supply of oil or natural gas will peak and subsequently decline. These are certainly important questions for future energy policy, although the exploitation of both new geographic locations and technological search and extraction strategies make such predictions subject to rather large uncertainties. We note that the group is active in the international Association for the Study of Peak Oil and Gas, and has organized its first international conference. On the other hand, we are not sure whether this research really belongs in the Physics departments, nor exactly what the future of this effort should be. However, in the merged department(s), this group might have natural interactions with existing energy research activities in Neutron Research and Physics-Fysikum, or if a Center for Energy Research is created, this activity might be housed there as part of a multidisciplinary effort involving also people from the engineering faculties.

18.4 Department of Neutron Research

18.4.1 General assessment

This department is focused on applied nuclear physics research. Its work is of direct relevance to nuclear energy, which is in turn of considerable importance to Sweden in view of the nearly 50% of electrical power that comes from this source, and the emerging possibility of further development of this source in the country. The research is also of international relevance to future possibilities in fusion energy. The department's work is carried out in close collaboration with the Swedish nuclear power industry, which for example provides direct support for specially commissioned energy-related external teaching. The group carries out materials diagnostic studies related to the safe handling of spent nuclear fuel. There are also internationally well recognized fast neutron spectroscopy diagnostic developments for fusion energy applications, such as the neutron spectra measurements at the Joint European Torus (JET) fusion research facility in the UK, including the discovery of an additional heating process in the d-t plasma by knock-on reactions of alpha particles, and future measurements of this kind at the Mega-Amp Spherical Tokamak (MAST) in the UK and the international fusion research center ITER to be built in France. Neutron cross section measurements at high energy (95 MeV) on deuterium gave a first indication of the presence of three-body nuclear forces, the existence of which has subsequently been confirmed by more elaborate polarization experiments at various other laboratories worldwide. Measurements are also being made of important neutron reaction cross sections up to 200 MeV for the design of future accelerator driven nuclear power systems (ADS), as well as for the understanding of single event effects in electronics, with these including the development of unique instrumentation and calibration of fast neutron detectors and calorimeters for external users with fast neutrons.

18.4.2 Quality of research

This research is of national importance and is of an internationally recognized standard especially in the nuclear fusion physics community.

18.4.3 Research environment and infrastructure

Besides the excellent collaboration and interaction with Swedish Nuclear Power Industry there are well recognized contributions to European and world-wide nuclear-energy and especially fusion-energy related projects.

18.4.4 Networks and collaborations

The Department has considerable outside interactions and collaborations, and it is to their credit that they derive much of their funding from outside sources.

18.4.5 Opportunities for renewal and emerging science

We suggest expanded activity in ADS, e.g. via the future Multi-purpose Hybrid Research Reactor for High-tech Applications (MYRRHA) in Belgium, as well as in fusion via the International Fusion Materials Irradiation Facility (IFMIF) in Italy.

18.4.6 Actions for successful development

We recommend closer collaboration with energy-related research in the Department of Physics, particularly in the teaching of courses. The department also might consider merging with this group to form a broader-based group in energy research that is critical for the future, but we also recognize that its scientific base is more closely linked to nuclear research in the Dept. of Nuclear and Particle Physics.

18.4.7 Other issues

We met a small group of students, who seem very satisfied with their research and education environment, and often obtain industrial positions in the nuclear power industry.

18.5 Department of Astronomy and Astrophysics

18.5.1 General assessment

The panel was impressed with the outstanding competence and enthusiasm at all levels in this department: students, postdocs, and faculty. The group activity is certainly world-class in the spectroscopy of low-mass stars, both in instrumentation and in data analysis, and it is a world leader in the observational and theoretical spectroscopy of low mass stars. There is also significant activity in planetary research, both within the Solar System and beyond it. We comment on these and other areas of significant achievement below.

18.5.2 Quality of research

The research achievements of the group in the study of the spectra of low-mass stars are becoming crucial for the study of the spectral shapes and features arising from galaxies with predominantly older stellar populations. Making use of the spectra of galaxies in the prediction of the types and numbers of stars of different types (population synthesis) is a promising new path in modern extragalactic and cosmological research. Multicolor photometry also permits estimating the redshifts of galaxies much faster and for significantly fainter and more distant galaxies than the presently used detailed high resolution spectroscopy.

In this context, we should mention that the spectroscopy of low-mass and low-temperature stars was during the last two decades not in the main stream of the development of cosmology and extragalactic astronomy, where the primary interest was in the most luminous objects in the Universe. However, the discovery of extrasolar planets and the general interest in the integral spectra of massive old galaxies has led during the last few years to a great interest in determining the properties of the most numerous and long living low-mass stars. The search for extrasolar planets has also become during the last decade one of the most rapidly developing branches of modern astronomy. The discovery of planets (and especially of terrestrial type) around stars is extremely important for our understanding of the origin of the life on Earth and the degree of its uniqueness. The UU group is thus well positioned to contribute significantly to these emerging areas.

In another distinct area, the panel also notes important results in the numerical modeling of the sedimentation of lithium in the stellar atmospheres of the oldest stars in our Galaxy. Such modeling is an essential step in the estimates of the primordial abundance of lithium, with this abundance representing in turn one of the most important tests of our understanding of nucleosynthesis during the first three minutes of the life of our Universe.

The panel also noted significant work in three-dimensional modeling of the convection and clouds in the atmospheres of red-giant stars, as partially confirmed already by interferometric infrared-observations of the red supergiant star Betelgeuse with the European Very Large Telescope (VLT) and inclusion of specific plasma effects in the numerical modeling of dust formation and dust behavior in cold rarefied atmospheres of red supergiant stars. We were also positively impressed with the group's ground-based spectroscopic support of the extrasolar planet search by the Hubble Space Telescope. This work covers a rich variety of activities, well balanced between instrumentation development and observational and computational astrophysics.

The panel also notes positively the ongoing collaboration with Solar System space experiments, in which the Uppsala-based Swedish Institute of Space Physics (IKF) is also a participant. We find it very positive also that the group is actively participating in the preparation of the scientific program and data pipeline for the ESA GAIA space astronomy mission, an ambitious project to chart a three-dimensional map of our Galaxy, the Milky Way; in the use of the data from the Herschel sub-millimeter observatory that will be coming soon; and in experiments with the future infrared James Webb Space Telescope, a giant successor to the very successful Hubble telescope. It is also noteworthy that the group has interest in experiments at a station in the south of Sweden which is part of the Dutch LOFAR low frequency radio interferometer designed to study processes in the early Universe. The Department is also preparing to work with the giant millimeter and submillimeter interferometer ALMA, a joint project of Europe/ESO, USA and Japan under construction in Chile.

The panel also notes an excellent return through the UU group from the Swedish government investment at the level of a few percent in the European Southern Observatory (ESO), and the European Space Agency (ESA), and in particular an exceptional share of observational time during recent years on the biggest telescopes of ESO, including the VLT.

As to future plans, the department expressed a desire to focus its activities on the three sectors of its present activities in which they are particularly strong (extrasolar planets / low-mass stars / galaxy formation), and the inter-relationships between them. It is also important to mention that, in all three of these topics, low-temperature atmospheres and similar physical processes define the spectroscopic absorption line formation. The panel encourages the Department to focus in this way, and believes that their ability to collaborate effectively with leading scientific groups in Europe and elsewhere and use the best observational facilities will lead to success in this self-generated strategy, in spite of the fact that the overall department program at first sight seems to involve many distinct projects over a relatively small number of people.

18.5.3 Research environment and infrastructure

A key strength of this department in experimental work is the development of better spectroscopic instrumentation, and in this they are internationally well recognized. Due to this, the group considers that the proposed Center for Accelerators and Instrumentation (which might also be called Center for Advanced Instrumentation) is an essential asset for their future activities, provided it is conceived as a center of research instrumentation with excellent specialists in electronic and mechanical design, as well as in project management.

The development of the large instruments involved, e.g. within ESO projects, in addition requires the formation of large experimental consortia. The group should maintain and further develop its leading role in some of these instrumentation projects, and suitable support from the University is vital in this respect, via CAI and outside of it as well. As one specific example of the importance of such technical support, we cite the construction of the European Extremely Large optical Telescope (ELT), which will be approved soon by ESO and which will require new extremely powerful and sophisticated spectrometers.

Concerning the high degree of computation involved in the department's numerical astrophysics research, the panel noted a potential problem in that the current inventory of computers is older and somewhat limited. In view of this and the fact that the UPPMAX computational network does not fully fit the needs of their particular algorithms, we thus recommend that they be provided with some new local computing power, together with suitable data storage and visualization capabilities. To date, the support for the local Linux

clusters and modern archives of observational data at the level of their needs has not been granted.

For this department, the panel noted a satisfactory balance between teaching and research. It is also good that the group has more than 20 active and as far as we can tell from a most interesting poster session, very satisfied PhD students, a number of talented young postdocs, and a healthy number of undergraduate students (ca. 100 per year in introductory courses). We should however mention that the number of undergraduate students is very low in comparison to the majority of American universities, where undergraduates often choose astronomy/astrophysics/cosmology as an additional scientific “breadth” course, and are stimulated to choose these fields by the rapidly developing research of the surrounding Universe; the fact that undergraduates at Uppsala are more focused on a major field throughout their studies without the need for such breadth courses may however be the reason for this difference.

18.5.4 Networks and collaborations

Beyond an obvious and extensive set of international collaborations through the projects mentioned above, the panel took note of the close relationship with the IRF, whose staff is also active in the graduate education of the department. The interaction with the plasma physicists there led to a set of interesting results on low mass stars (maps of magnetic field fine structure, etc) and the panel hopes that the IRF will also play an active role in a proposed Center for Advanced Studies of Planetary Systems.

18.5.5 Opportunities for renewal and emerging science

The panel also heard about several future objectives, like the establishment of a Center for Advanced Studies of Planetary Systems (CASPS) and the development of a new group in solar physics based on the existing excellent Swedish solar telescope on the Canary Islands and the scientists working on it, with the Canary group being very interested in moving to Uppsala. The panel in general reacts favorably to these two objectives, but the financial details of the Canary project transfer need to be worked out so that they do not negatively impinge on the existing activities or other future developments of the Department. The panel thus supports such a transfer if it is realistic in the foregoing sense, because it will strengthen the collaboration of the group with the Institute of Space Physics (IKF) as it enters the Solar Orbiter project of ESA. The panel also supports the idea to build a Planetarium at Uppsala with private funding so as to increase the impact of this science on the general public

18.5.6 Actions for successful development

We have noted above the need for a strong CAI and better computational resources. Beyond this, due to several foreseen retirements in the near future, the group should try to avoid losing its present momentum and if possible enhancing its activities by hiring strong and well-chosen people and insuring as much as possible an overlap in time between people leaving and newcomers.

18.5.7 Other issues

We found the graduate students and postdocs to be an impressively talented and enthusiastic group.

18.6 Department of Physics

18.6.1 General assessment

This is a large, world class, well-recognized, and diverse effort that is aimed at studying various aspects of what we have earlier referred to as the visible matter around us: atoms, molecules, liquids, clusters, solids, surfaces, interfaces, and various nanoscale ensembles of these representing future technological materials or devices, energy-related research, and biotechnology. The department thus groups what in some physics departments would be atomic and molecular (AMO) physics and condensed matter physics, and its relative size (see figure 18.1 in General Comments) reflects this diversity. The broad purview of the department's research spans very basic studies of atomic and molecular electronic structure and dynamics to more applied investigations involving applications-oriented materials and nanostructures. Fysikum scientists are involved in a large number of outside collaborations: for example, there are numerous projects and grants involving researchers in the other departments at UU. The close proximity of many of these collaborators in the Ångström Laboratory is a significant advantage. There is a good balance between basic and applied research.

A particular strength of this department is in the development of new instrumentation and its associated spectroscopic techniques and applications areas, with this building on a long tradition in Uppsala that led to its most recent Nobel Prize. We find this tradition to be continuing into the next generation. Included in this is a strong emphasis on the use of synchrotron radiation to probe various aspects of matter, with much research and development being done at the Swedish national facility MAX-lab, in which Uppsala is a key and crucial participant. In fact, a UU professor is the current director of this national facility. The Department is also on the national scale one of the heaviest users of large materials science facilities such as synchrotron radiation sources, and, to a lesser but growing degree, also neutron sources.

Another significant strength is an excellent group of theorists, and the very close coupling between experiment and cutting-edge theory that is used to interpret data or suggest new experimental directions. These theoretical developments span the interpretation of atomic, molecular, surface, and solid-state spectra, the understanding of various effects in nanoscale magnetism, and the prediction of phenomena at high pressures of interest in geology and geophysics.

The Department is, together with other groups at Uppsala University, the main center for magnetism research in Sweden, and this represents a significant specialization that takes advantage of both experimental and theoretical strengths.

The physics education group has as their main scientific objective improving teaching and learning in physics through studying and understanding of the experience of learning physics and how this relates to the educational environment. Their research is directed to teaching and learning at the university level, which is particularly fruitful for the group as well as for all of the departments of physics, where their colleagues can directly benefit from this didactics research. In particular, their study on students' understanding of probability and other difficult-to-grasp concepts in quantum mechanics is of importance to the physics community in general. This is a unique research focus in Sweden and a recently-initiated activity at Uppsala University. Therefore, it is still in a stage of development.

As to gender profile, we were impressed with the degree to which females are involved in the department's research at all levels, as well as in its presentations to us. We also note that the head of the department is a female, and that an outstanding female AMO physicist has recently been added as Professor. We find this to be a very positive improvement in terms of female professors in physics at UU.

18.6.2 Quality of research

We first note that there are various indicators of the world-leading standard of research in this department: about 50 invited or plenary talks per year at international conferences, an extensive list of prizes and awards to both senior and junior research staff, and perhaps most significantly, a high number of tenure-track awards to young faculty (see figure 18.1 in General Comments). The research funding of the Department also reflects a high-quality effort, with 15 EU-funded activities based on 55 research contracts from the Swedish Research Council.

To provide a template for more detailed assessment, we heard presentations in the general areas of: instrumentation development, magnetism, interfaces and low-dimensional materials, energy-related research, AMO physics, soft matter physics, theoretical method development and applications, and research in teaching education. These areas are distributed over seven adminis-

trative units within the Department: Physics I-functionalized interfaces, liquid photoelectron spectroscopy (H. Siegbahn), Physics II-x-ray emission applied to strongly correlated materials and in-situ studies of liquids, surfaces and interfaces (J. Nordgren), III- materials physics (B. Hj.varsson, A. Rennie), Physics IV-theoretical modeling of materials (B. Johansson), Physics V- surfaces and interfaces, AMO physics (N. Martensson, S. Svensson), Theoretical Magnetism (O. Eriksson), and Physics Education Research (C. Linder). Bridging most of the experimental areas is the use of synchrotron radiation, and to a lesser degree, also neutron scattering and spectroscopy.

The committee considers that the research is world-leading in several aspects of instrument and technique development, as well as in theoretical and computational methods and their applications.

Considering first instrumentation development, we highlight as world leading research the development of high-resolution electron spectrometers, soft x-ray emission and resonant inelastic scattering spectrometers, instrumentation for high-pressure and liquid-state electron and x-ray emission spectroscopy, and a newly-developed Fourier transform spectrometry for vacuum ultraviolet radiation. These instruments have incorporated many creative state-of-the-art ideas, are meticulously engineered and built, and have led and will lead to new scientific results in-house, at MAX-lab and at other synchrotron radiation laboratories around the world (e.g. at the Advanced Light Source in Berkeley where they provided some of the most outstanding early work when this facility began operation and still are key to its success, and more recently at BESSY II in Berlin and many others). As one example of the creative application of these instruments, the UU group has been key in the development of the so-called “core-hole clock” method which combines photoelectron and Auger electron spectroscopy so as to study charge-transfer processes on the femtosecond timescale, something which cannot be done by any other method at present. The electron spectrometers and x-ray spectrometers are in addition sold commercially by the Gammadata/Scienta Company in Uppsala, and they are the world standard against which others are judged. Physicists from this Department are also involved in other spinoff high-technology firms in Sweden: e.g. NM Spintronic and AMACC. We also note other innovative instrumentation and experimentation projects that are in some ways at the forefront of these developments, as e.g. electron or x-ray spectroscopy at high ambient gas pressures and/or from liquids that will permit studying systems of much greater practical importance than has been possible in past work, electron spectroscopy with hard x-ray excitation that is permitting the study of buried interfaces in nanoscale devices, an electron-ion coincidence spectrometer permitting higher energy-resolution studies of the photodissociation of molecules, and a time-of-flight electron spectrometer for time-resolved photoemission studies, with the last instrument also being commercialized. The Department has been and will continue to be a key contributor to the development at MAX-lab, with research projects there in surface, interface, and

condensed matter physics, as well as atomic, molecular and cluster physics. It is also positive that the UU team has received funds to build a new neutron spectrometer at the Institute Laue Langevin (ILL) in Grenoble. In connection with instrumentation development, we note the recent retirement of a senior professor who was much involved with this (U. Gelius), and we comment on the need to fill this position below.

The research in soft x-ray emission and inelastic scattering, as applied to a variety of forefront systems (high temperature superconductors, liquids, fuel cell surface interactions), as well as that on surfaces and interfaces we consider to be world-leading in several respects. The work on liquid-phase photoelectron spectroscopy has been a world leader for some time, with new instrumentation under development that should maintain its competitiveness. The work on atoms, molecules and clusters is of an internationally high standard and on energy and soft matter we consider to be internationally recognized. A focus on energy research we find to be a good idea for the future, and we would encourage further development of this, perhaps in interaction with the Neutron Research Department, at least in the teaching of courses, and perhaps also via a multi-department Center for Energy Research.

In-house synthesis and characterization of various types of materials, molecules, and nanostructures also represent significant and essential activities in providing samples for study that are at the cutting edge of the relevant science area involved. We were impressed with the facilities available for this, including samples as strongly correlated materials (a collaboration with the Chemistry Department, magnetic nanolayers, molecular magnets, novel hydrogen storage materials, and model battery-electrode structures (another collaboration with Chemistry). In characterization, it is most positive that facilities are available for electron microscopy, x-ray diffraction, magneto-optic Kerr effect measurements, SQUID magnetometry, and scanning tunneling microscopy.

We have some concerns concerning the research in soft matter, as the research described to us was very diverse and we consider that it requires more thought. In particular, we enjoyed the description of the work on clusters and on biomolecules, but considered that on colloids and phase transitions to require more planning. We had some doubts that the test of QED would be useful, although we note that other groups are also attempting this using the spectroscopy of very highly ionized atoms. The spectral work on porphyrins and the development of clinical detection methods of modified hemoglobins in malaria seems to be a valuable practical application of basic science. The initial spectroscopic work on wet systems and soft matter including the mixture of liquids, the ionization of smaller and larger biological molecules opens new experimental windows to follow molecular states that may be invisible by other methods. To develop these methods for the most exciting problems in the future, enhanced collaboration with chemists and biologists will be valuable.

Looking ahead, the committee considers it positive that there are various avenues for the synthesis of new materials and that they will be examined both with conventional and novel instrumentation. We note that there are new instruments being produced for the MAX IV facility in Lund and that the group is taking part in the SUPER-ADAM upgrade at ILL.

Now looking at theory, we believe that the condensed-matter theory activities in both materials modeling and magnetism have grown to world-class status in Uppsala University over the last 20 years. At the core of the activities is a strong tradition and a diversified effort in electronic structure calculations and other activities in atomic-scale computational materials science. The group has made important contributions to the international effort in method development, also in the form of several widely-used computer codes. The effort has expanded from density-functional calculations for solid-state properties towards Monte-Carlo and molecular simulations for dynamical and temperature-dependent phenomena. It continues to expand the methodologies towards multiscale materials modeling. There is a particularly fruitful connection to and collaboration with experimental research, both locally in Uppsala and worldwide. Theoretical magnetism can be seen as a spin-off of the condensed-matter theory activities. New branches of theoretical and computational activities include efforts in soft-matter and biomolecular modeling, largely based on extensions of density-functional methodologies. There is an obvious interdisciplinary flavor to the work. There are highly visible scientists among the junior faculty. Serious attention should be paid to the continuation of the dynamism of the activities in view of the imminent retirement of the Börje Johansson.

Finally considering physics education research, we find the presentation, plans, and publication record of this small group to be very good, and believe its research is of an internationally recognized standard.

18.6.3 Research environment and infrastructure

Within the Department, thought should be given to reorganizing the administrative structure now represented by Physics I-V and Theoretical Magnetism, and Physics Education Research into groups more representative of the actual subject divisions, as e.g. magnetism, interfaces and low-dimensional materials, energy-related materials, experimental methodology, theoretical modeling, molecular and soft matter research, and physics education, which are listed as the key future areas of activities. Some of the present divisions seem somewhat based on past history rather than present relevance.

As noted elsewhere in our report, we strongly support the creation and adequate funding and staffing of the CAI. The resources of it are crucial to maintaining this department's international standing.

We appreciate the desirability from a funding point of view to create focused centers, but we feel that too many are being proposed; focusing on a few

would make more sense. One of the several proposed that we support strongly is a Center for Materials Modeling, and perhaps also a multi-department Center for Energy Research. We note also that the report of the Chemistry Panel (Panel 14) recommends a Center for Modeling and Simulation that is closely related to the Center for Materials Modeling mentioned above; avenues for making these efforts optimally synergistic, including even a potential merger if their scientific areas or interest are not too different, should be explored. We are not sure of what additional synergism a Center for Scattering (which we suppose is really a Center for Spectroscopy and Scattering) would provide. However, we appreciate that such Centers are one mechanism within the current funding avenues in Sweden for augmented funding.

Finally, the physics teaching research group comprises seven people at present, including four PhD students. It is quite fruitful for this to be an integral part of the Department of Physics, with its several strong theoretical and experimental research groups.

18.6.4 Networks and collaborations

We have commented above on the extensive interactions with other departments at UU, which include joint grants, major initiatives, and co-authored papers with the Departments of Materials Chemistry, Engineering Science, Biochemistry and Organic Chemistry, Physical Chemistry, and Physiological Botany, and the Center for Photomolecular Science. This is very positive, and we encourage its further enhancement.

The national and international connections and networks are also excellent, including European, North American, South American and Asian collaborations, the use of major experimental facilities around the world, and lively interactions and exchange with developing countries.

There is also extensive involvement in the organization of international conferences and workshops, as e.g. the International Conference on Electronic Spectroscopy and Structure that was held in Uppsala.

18.6.5 Opportunities for renewal and emerging science

There is a strong, ongoing commitment to MAX-lab which will continue at the planned MAX IV synchrotron facility and there will be a new commitment to the neutron scattering facility at ILL. The realization of the MAX IV facility is quite important for a large number of the experimental activities at this department, both in terms of instrumentation developments and experimental stations for collecting data. Overall, the impact of the MAX IV project is expected to be stronger for the department as a whole as compared to the European Spallation Source project, which is also proposed for construction in Lund. With its strong interests and involvement in these large-scale experimental infrastructures, the Department should nonetheless insure that there is

also continuing good support for the excellent in-house work on magnetism, interfaces, and in a broader energy group. These all require both personnel and equipment if they are to realize their full potential. We repeat that the CAI is key here.

In theory, there is a solid foundation for further success in computational materials science, as evidenced by the many outstanding achievements in magnetism, metallic alloys and other new materials design. In particular, the activities can in the future provide crucial support for the experimental activities in electron and neutron spectroscopy, such as studies of excitations, dynamical and non-equilibrium processes. There are also forefront activities in cluster science and time-resolved spectroscopy of biomolecular processes at surfaces. The theoretical and computational groups should seize the opportunity to extend their activities towards supporting these developments.

This physics education research activity represents in itself a renewal activity at UU and it is still in the process of establishing itself. The group has a good mixture of senior and junior personnel and is of adequate size for the present.

18.6.6 Actions for successful development

We have commented on the desirability of reforming the present organizational structures represented by Physics I-V, Magnetism, and Physics Education Research so as to better map onto the actual future focus areas of the Department. This reorganization would probably assist also in preparing for the eventual merging of all of physics and astronomy into one department.

In experiment, we support the basic directions outlined to us, with novel instrumentation and facilities that will insure forefront measurements. We consider that the research into magnetism, interfaces, atoms, molecules and clusters should be strongly supported. The research on energy systems should be strengthened and to some degree combined with neutron physics to form a strong energy unit which has a stronger interaction with industry in Sweden. A senior faculty hire into a presently vacant position to provide future leadership, especially in view of impending retirements over the next 5-10 years of some of the current leaders of the department, is also desirable. Some areas of possible interest in this might be a specialist in the fabrication of nanomaterials and nanopatterning, the spectroscopy of strongly correlated materials, the synthesis and characterization of energy-related materials, spectromicroscopy and/or imaging with synchrotron radiation, or femtosecond/attosecond physics that will relate to future free-electron laser light sources, areas that are not presently represented in Physics-Fysikum. However, we caution that any hires in new areas should not stretch personnel and laboratory resources too thinly over too many projects (see General Comments on breadth of activity at the beginning of this report).

In the area of theory, the committee welcomes the new initiatives and directions in method development, including theories of strong correlations, multi-scale modeling, and novel basis sets and algorithms. We have noted the need to replace a key senior faculty member (Börje Johansson) at his retirement, and including a faculty hire in many-body theory would be one very positive step. Maximizing constructive interactions with theoretical efforts in the Chemistry Department is also desirable for the future.

18.6.7 Other issues

We were most impressed with the younger scientists and students we met. We have also noted the high number of 6-year tenure-track awards the younger faculty have received, which certainly bodes well for the future.

19. Panel 14

19.1 General assessment of the departments and units

The panel was generally very impressed with the research being carried out in Chemistry. The Section as a whole has responded well to difficult external conditions (low numbers of chemistry students) in a reactive fashion by making the most of international (predominantly EU) and national cooperative funding programmes. In particular, the Department of Biochemistry and Organic Chemistry and that of Photochemistry and Molecular Science have implemented very impressive plans to ensure their future competitiveness and, in the case of the Department of Biochemistry and Organic Chemistry, to ensure a smooth and productive handover from the retiring Chair. These two Departments should serve as models for the renewal process that now has to take place in the remainder of Chemistry.

However, in order to become more competitive with chemistry faculties in Sweden and worldwide by attracting more students and increasing its international visibility, the Chemistry Section at Uppsala must take active measures to complement the existing funding efforts. The panel has, therefore, proposed a series of strategic measures that they feel will help Chemistry in the short and medium terms. The first of these is to streamline the administrative structure of Chemistry in order to maximise flexibility and effectiveness. The second measure, and that which the panel expects to have the most short-term impact, is to establish two *international* M.Sc. programmes that should be taught in English and advertised aggressively internationally. These degree courses should use the existing strength within the Department to attract *additional* chemistry students. Two further measures intended to help junior faculty and to provide additional nucleation points for further cooperative projects within the Chemistry are to form mentoring committees for junior faculty and to provide seed-funding for new cooperations.

19.2 Department of Biochemistry and Organic Chemistry

19.2.1 Summary

The department consists of biochemistry, organic chemistry applied to biology and pure organic chemistry. The Panel was very impressed by the quality, the

breadth and depth of the science, the interactions both within the University and internationally, and the age distribution. Professor Baltzer is showing clear leadership and his science is ideally placed to lead both Biochemistry and Organic Chemistry. We commend the University for making such a suitable external appointment.

19.2.2 Quality of research

Presentations were made by four members. Professor Bengt Mannervik, who has made fundamental advances in enzymology and has introduced novel concepts in drug discovery. His former colleague, Professor Helena Danielson has taken on the mantle of a rigorous approach to drug discovery based on enzyme inhibition in which she is pursuing the basic principles of drug design. She has set up a start up company (Beactica), based on her work. Professor Lars Baltzer has performed highly innovative work designing peptides for catalysis and more generally for binding molecules for practical purposes and to understand molecular recognition. Professor Pher Andersson is a pure organic chemist who combines experiment and computer simulation to design useful reactions for organic synthesis and to understand the chemistry. He chairs various international collaborations. Doc. Henrik Ottosson is a very impressive, thoughtful, young organic chemist who works on silenes as reagents, triplet state aromaticity and alternative conjugation technologies. He organises U3Net.

The senior members are all highly respected world leaders in their fields. The junior members are of internationally high standard are expected to become world leaders.

19.2.3 Networks and collaborations

There are satisfactory internal and international collaborations

19.2.4 Renewal and actions for further development

The department has, under Professor Baltzer's leadership, embarked on a programme of renewal. Their groups are minimal in size and they need to become larger. Their technologies are such that collaborations with other groups will be synergistic. They need seeding money from the University to catalyse these collaborations.

The department is active in teaching. They are ideally placed for being a focus of an *international* masters course in Chemistry.

19.3 Department of Photochemistry and Molecular science (FOTOMOL)

19.3.1 Summary

The Department of Photochemistry and Molecular science (FOTOMOL) is the youngest of the four departments visited and established operations in 2006. Research is mainly focussed on artificial photosynthesis, more specifically on the generation of hydrogen from water and light. The committee took very positive note of the multidisciplinary nature of approach, which includes molecular microbiology, advanced organic chemistry, but also a number of chemical-physical techniques to analyse the elementary steps of the photosynthesis process.

The age distribution of the scientists is well balanced between senior expertise, driving mid-career persons and young promising talents to develop. The number of female scientists is high. The committee is also sure that the program is attractive for students and provides a relevant qualification for both the academic and industrial job market. Thus, it may increase the number of chemistry students in a future masters programme.

19.3.2 Quality of research

The general impression of the quality was very good: the team is very motivated, well managed and clearly very visible at an international level. The senior members are world leaders.

FOTOMOL is also suited to play the role of a light-tower for the visibility of Swedish chemistry on a European level; the existing national know-how in photochemistry on a very high level is to be preserved.

19.3.3 Networks and collaborations

There are exceptional internal and international collaborations

19.3.4 Renewal and actions for further development

As the department has just established itself in a very positive manner, there is no immediate action needed. The current problems of the department are just related to the recent move of key activities of the programme to Uppsala and the resultant teething problems, such as the lack of access to the pool of students. Parts of these problems may be solved by integrating of the department more closely in the teaching activities of chemistry, potentially as a result of an organizational restructuring of the faculty of chemistry as a whole and the other chemistry departments. The introduction of an international masters course on for example “Energy Chemistry” would be another attractive option to increase the student base of chemistry at Uppsala University.

19.4 Department of Physical Chemistry and Analytical Chemistry

The panel visited the units of Physical and Quantum Chemistry and those of Analytical and Surface Biotechnology on different days. As these units also form distinct blocks within the department, we have reported on them separately.

19.4.1 Physical and Quantum Chemistry

Summary

The units of physical and quantum chemistry are currently in a transition period that makes assessing their international performance difficult. However, these units offer more than any others a unique opportunity for renewal within the framework of chemistry in Uppsala.

Quality of Research

Professor Sten Lunell has been at the forefront of the theoretical treatment of radical reactions for many years. The loss of Petter Persson and Prof. Lunell's work as dean have slowed down the group in recent years. Nonetheless, many experimental groups interested in calculations have benefited from Prof. Lunell's presence in Uppsala since Quantum Chemistry moved into the Chemistry Section.

Katarina Edwards and her group are performing work of an internationally high standard that should be encouraged and supported. The panel, however, questions whether this group is correctly situated within the Physical Chemistry Programme and whether another affiliation would provide better integration and security. The mesoscale simulation group led by Christer Elvingsson and Malek Khan provides an important extension of atomistic modelling techniques and is doing work of an internationally recognised standard. This group would profit from a strong chair of theoretical chemistry integrated into the general subject areas of Chemistry as a whole.

The panel was unable to judge the quality of Piotr Froehlich and Erik Sjöqvist's work as it lies outside their areas of competence. The presence of these two groups within the Department of Physical and Analytical Chemistry testifies to the unique history of Uppsala as a centre of quantum theory, but maybe they would be better housed in physics.

Networks and collaborations

Because the departments are in flux, they are not as strongly networked as other groups in Uppsala.

Renewal and actions for further development

The unique history of quantum chemistry in Uppsala, and the presence of many computationally oriented groups within the individual departments strongly suggest that the upcoming professorship of theoretical chemistry will be a key strategic appointment. Currently, for instance, an above average number of computational groups are dispersed throughout the experimental units. This concentration of competence in modelling and simulation is a hidden strength of chemistry in Uppsala.

These groups are closely integrated in the experimental areas and some work both experimentally and computationally. However, this dispersion occurs at the cost of sacrificing a potentially world-class environment and competence in modelling and simulation. The appointment of a theoretical or computational chemist with broad interests and the ability and character to integrate the various theoretical disciplines to head a virtual centre of modelling and simulation will provide new impetus for computational work within Uppsala and make the most of the competence that is already available here. In this case, the exact area of specialisation of the appointee is less important than her/his ability to inspire and integrate different theoretical groups and to support modelling and simulation work within the experimental groups.

19.4.2 Analytical Chemistry

Summary

The unit of Analytical Chemistry headed by Professor Jonas Bergquist has an optimum balance between fundamental and applied research. The research related to liquid separations and mass spectrometry in life sciences is of high international level. In addition, the equipment in the unit is of a high quality and quantity, and the infrastructure is good. However, to guarantee the continuity of the high quality of the research in the unit of Analytical chemistry the necessary steps should be taken to fill the currently vacant chair of Karin Markides and thus provide clarity and security.

Quality of the research

The growing importance of mass spectrometry, especially in life sciences, is widely recognised. Synergistic effects can be achieved by coupling liquid separation techniques such as liquid chromatography and capillary electromigration to mass spectrometry. The unit of Analytical Chemistry has been, and is scientifically in the forefront in the development of these fields at least in Europe, perhaps also worldwide, and their fundamental research focussed on the development of ionization techniques for mass spectrometry, and those related to the use of different chemometrics tools, complete the research profile of Analytical chemistry excellently.

By developing multidimensional liquid-based separations with high-resolution mass spectrometry in combination with multivariate

analysis, the unit of Analytical Chemistry also plays an important role in screening of body fluids and small amounts of tissue samples in the multi- and cross-disciplinary Uppsala Berzelii Technology Center for Neurodiagnostics, which focusses on finding biomarkers for neurorelated diseases. The centre has been established for a period of ten years and started operation at the beginning of 2007 with more than 2 M Euro yearly funding.

The studies carried out by green technology junior group headed by Charlotta Turner are still in their infancy, but the plans of Turner add an attractive component to the research profile by accessing natural actives and nutraceuticals extracted from defined biowaste using critical and subcritical pressurized fluids.

Networks and collaborations

Jonas Bergquist and Charlotta Turner have wide and active national and international networks and collaborations.

Renewal and actions for further development

The plans for the integration of the surface biotechnology group (Carlsson/Fornstedt), the lipid group from physical chemistry (Edwards) and Analytical Chemistry & Neurochemistry unit into a larger biomolecular separation and analysis unit are to be encouraged. An integrated unit would have an excellent chance to form the nucleus of a further centre within a unified chemistry department. The expertise available in the unit of analytical chemistry would absolutely benefit from the expertise of several scientists working in other units of Chemistry, and *vice versa*.

Others

Three Phabian Awards granted in 2004-2006 to PhD students in Analytical Chemistry are indicators of high-standard doctoral training in the unit of Analytical chemistry.

19.4.3 Surface biotechnology

Summary

The unit is well equipped and has developed a number of powerful techniques and diagnostic systems with high practical relevance. Karin Caldwell, who enjoys an excellent international reputation in the field of size/mass characterization of colloids, and nanoparticles on surfaces, has recently retired from the post of Professor in Surface Biotechnology. The recent work of adjunct professor Jan Carlsson is focussed on the applicability of membrane-assisted isoform immunoassay to early diagnosis and therapy monitoring of metabolic disorders through isoform analysis. The techniques developed have great potential for replacement of available tests. Dr. Torgny Fornstedt concentrates on fundamental and theoretical aspects, which are important for a better under-

standing of separation processes and interactions between surfaces and pharmaceutical molecules/biomolecules in the field of separation science.

Quality of the research

The quality of the research is of an internationally high standard, and the research has made a great impact.

Networks and collaborations

International cooperation with universities is quite active, and because much of the research has practical relevance, links with industry are strong.

Renewal and actions for further development

The research carried out in the unit of surface biotechnology has clear link to that in the unit of Analytical chemistry, and accordingly would have a great potential especially within a larger biomolecular separation and analysis unit established in the future. The vacant chair of Karin Caldwell should be used as a strategic tool to optimise the research profile of this new unit.

Others

A PhD student in surface biotechnology supervised by Dr. Torgny Fornstedt received the first Phabian Award in 2005, indicating a high acceptance of the work in the applied bioanalytical environment.

19.5 Department of Materials Chemistry

19.5.1 Summary

Materials chemistry is the largest department and hosts a wide variety of expertise and shoulders a large teaching load. The department comprises 11 professors, 31 PhDs and 80 scientifically active persons. In addition to 15 MSEK (38%) internal funding, the department recently acquired 24.5 MSEK (62%) outside funding. It hosts three major programmes: Inorganic Chemistry, Structural Chemistry and Polymer Chemistry. Traditionally, inorganic chemistry, and especially solid-state chemistry, has been strong in Sweden and also in Uppsala. This expertise should be preserved and further developed towards new functional materials on all length scales. Clearly, this has been recognised by the faculty of chemistry. Like most of the other departments in chemistry, Materials Chemistry has been reassembled under up-to-date scientific umbrellas, i.e. nanoscience, thin film technology, energy storage and conversion and polymer synthesis and applications. The research infrastructure is excellent, both in terms of instrumentation as well as lab space. Most Materials Chemistry groups suffer from the small number of PhD students because of high overall salary costs, although compared to some other departments they have good access to the student pool.

19.5.2 Quality of research

The committee was impressed by the research profile of Jöns Hilborn, who has been able to establish a very competitive research laboratory in the area of tissue engineering. This activity should be strengthened further.

The “Structural Chemistry” programme complements the FOTOMOL activities well and represents a possible second nucleus in energy conversion and storage. A kinetically fast high-energy lithium battery will most probably become the next large evolutionary push to world-wide energy development. Josch Thomas’s and Kristina Edström’s research is well placed to be able to participate substantially in this international rush.

The work of Mats Boman and Annika Pohl towards functional mesoporous and nano materials provides an important competence and future focus on functional materials. However, this will have to be enhanced further and accelerated into a more creative and unique enterprise to reach the international forefront.

Kersti Hermansson provides an important theoretical expertise to this department, and she clearly enjoys international standing in modelling and analyzing catalytic oxides and ions in solution. Her methods development is aimed in the right direction, i.e. interscale problems, but could be enhanced within a broader theoretical chemical nucleus in the faculty.

Karin Larsson, although somewhat more specialised, is an expert in modelling thin film growth, of interface problems, surface functionalisation and surface electrochemistry. As such, her expertise is of great value for the experimental surface science groups in the department. There is complementary expertise in thin film growth at the department which, however, should enhance its scientific visibility.

19.5.3 Networks and collaborations

Collaborations and networking are well-developed and used broadly throughout the department. The materials science programme of the physics faculty is seemingly related to that of the materials chemistry and the panel wonders whether collaborations between these two could be enhanced.

19.5.4 Renewal and actions for further development

The process of renewal in this department is an ongoing process that will include replacing two chairs in 2010 and 2011. It is our strong opinion that these replacements should be used to strengthen the role of Materials Chemistry in Uppsala as it is currently somewhat under-represented compared to biological chemistry. Thus, the upcoming decisions that will define new research lines and a more targeted combination of research groups will be of pivotal importance and must be used to enforce the renewal process towards cutting-edge research the classical and novel domains of inorganic and materials chem-

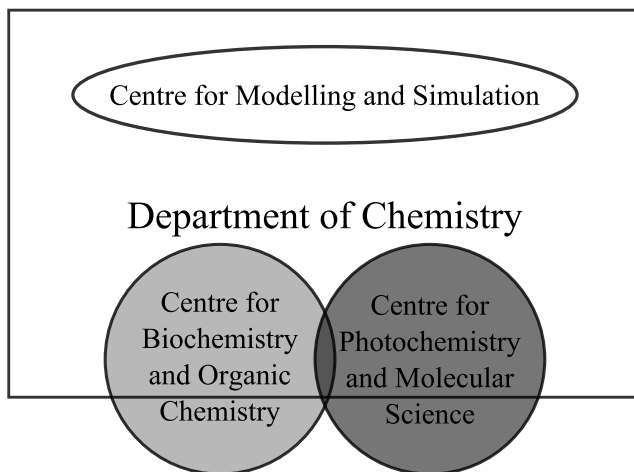
istry, for example in the fields of novel functional materials, nano devices and energy systems. This has been initiated by installing the groups of Jansson, Nyholm, Pohl and Westin which have the potential to produce a strong synergy in future. The process and planning for renewal within the Department of Materials Chemistry is, however, not as advanced as those in FOTOMOL or Biochemistry and Organic Chemistry, so that Materials Chemistry should be allowed the time to develop nucleation points and synergistic research cooperations that fit conceptually within the concept of a Department of Chemistry as a whole. The expertise available in Structural Chemistry would, for instance, be important to allow Uppsala Chemistry to diversify towards novel attractive education profiles, such as a masters degree in “energy chemistry”.

19.6 Actions for successful development for Chemistry at UU

The panel feels that Chemistry would benefit from a streamlining of its structure by unifying the existing four departments into a single Department of Chemistry. The panel, however, also recognises that the excellent planning and strategic development achieved by the Departments of Biochemistry and Organic Chemistry and of Photochemistry and Molecular Science are exemplary for an ideal future scenario for Chemistry as a whole. These groups have appointed young and dynamic heads of department and have managed the handover from dominant and internationally respected personalities well in advance. Thus, within the unified Chemistry Department, there would be two specialised centres, one for Biochemistry and Organic Chemistry and one for Photochemistry and Molecular Science. As a third structural measure, a virtual Centre for Modelling and Simulation should be formed within the department in order to strengthen and unify the existing competence in computational chemistry under the leadership of the professor of Theoretical Chemistry, who is to be appointed. The following Figure demonstrates the proposed structure.

The mission of the Department of Chemistry should be to develop similarly successful and focussed groups in strategic directions in order eventually to spin-out further centres similar to the two proposed. The panel sees the opportunity to define new priorities at a time in which many chairs can be appointed as a major chance for Chemistry in Uppsala. However, this opportunity requires strategic, rather than uncoordinated, hiring and a critical analysis of the strengths of Uppsala Chemistry. The panel was a little disturbed by what they perceived as a tendency towards internal appointments for chairs and emphasises that dynamic new blood is a key to making the most of the potential clearly available in Uppsala.

The proposed virtual Centre for Modelling and Simulation serves to derive the maximum benefit from the concentration of computationally oriented



groups without removing them from their close contacts with experimental colleagues. The function of this virtual centre, however, is to raise the awareness of computational techniques, form new bridges between the individual groups and the techniques that they use and to coordinate and optimise such central features as software purchasing, hardware maintenance etc. The new Chair of Theoretical Chemistry would be expected to provide the scientific integration and to some extent leadership for this common-interest group within the Department of Chemistry and was seen by the panel as one of the first opportunities to implement the renewal strategy outlined above.

The structural measures suggested above are expected to remove many of the potential scientific misfits within the existing structure. However, a prerequisite for this measure to be effective is a loosening of the present strict assignment of non-chair professorships to individual programmes. The new Chemistry Department should be as flexible as possible in order to be able to take advantage of new interdisciplinary nucleation points that may develop into future centres of excellence. Most important is that Chemistry speaks with one voice and uses opportunities such as the Linne Programme of the university to initiate new strong lines of cooperation across the existing programmes.

A key to developing Chemistry in Uppsala successfully is to attract more students. The panel considers that the most promising measure that can be expected to have an immediate impact is to use the strengths of Chemistry to establish two international interdisciplinary M.Sc. degrees. The suggested subjects for these degree courses are:

- **Energy Chemistry:** A degree course that concentrates on the chemistry of energy and fuel generation and storage. The Centre for Photochemistry and Molecular Science and the present Department of Materials Chemistry are excellently suited to conceive and teach such a course.

- **Biochemistry and Organic Chemistry:** The existing excellence in the Centre for Biochemistry and Organic Chemistry, the existing Department of Physical and Analytical Chemistry and also the polymer activities provide an excellent basis for a course in modern synthetic, mechanistic and analytical biological chemistry.

The immediate advantage of these Degree courses, which must be advertised aggressively and internationally, is to attract *additional* motivated students to study chemistry in Uppsala. This will provide an immediate influx of potential graduate students, improve the financial situation of Chemistry and, indirectly and over a longer term, improve the visibility and attractiveness of undergraduate chemistry in Uppsala. The work already done in reconceiving the bachelors teaching programme will be of great value in helping establish modern masters degree courses as quickly as possible.

A further strategic development that the panel feels would benefit the Chemistry Departments is to provide a mentoring scheme to support young faculty. One such measure would be to support every young faculty member by appointing a board of mentors. This could typically be three tenured faculty members, two from within Chemistry but not from the immediate programme to which the young faculty member belongs and one from another section or faculty. The function of this board of mentors would be to advise and support the young faculty member as much as possible and also to ensure that the scientific environment is as conducive as possible to the development of the young faculty member as an independent researcher. A guaranteed and universal level of support for all young faculty members is also desirable. The insecure and varying situation of assistant professors should be firmed up to enhance better young, creative and upcoming new science. If at all possible, Chemistry should make as much use as possible of Tenure-Track positions. This will require the conscious decision to hire young faculty at the expense of some more senior positions.

An important structural measure that is specific to Chemistry is that the university should make funds available for seeding cooperative interactions between various groups. This targeted measure will provoke the nucleation of new areas of specialisation that will eventually lead to spinning out new centres analogous to the very successful FOTOMOL and Biochemistry and Organic Chemistry units. These funds are an important flanking measure to strengthen the effect of forming a single Chemistry Department intended to develop new strengths in an active and strategic renewal process.

20. Panel 15

20.1 Department of Bioorganic Chemistry - IBK

20.1.1 General assessment

The department of Bioorganic chemistry is a small department with one full professor and 10 further staff that conducts research notably in the field of nucleic acid chemistry and structure. The aims of recent research include the synthesis of new mimics of DNA and RNA designed for therapeutic intervention and research into single-stranded DNA and RNA conformation. The department is noted for structural studies of nucleosides and oligonucleotides and their complexes with various ligands using high-field NMR spectrometry.

20.1.2 Quality of research

The department performs research of an internationally high standard, as exemplified by the very good citation record of literature from the department. The head of department is the recipient of two international prizes, a further indication of his international reputation.

20.1.3 Research environment and infrastructure

One full professor directs the activity of the department which currently comprises 3 postdocs and 7 PhD students. The heavy equipment of the department consists of Bruker DRX-500 and DRX-600 NMR spectrometers. These are no longer competitive with the most recently available spectrometers and entail considerable running costs. However, the committee felt that the most demanding requirements of the department in this area in the future could probably best be met by the use of instruments available elsewhere.

20.1.4 Networks and collaborations

IBK is part of important national and international networks, including the European research project RIGHT (RNA Interference Technology as Human Therapeutic Tool). This network involves 22 research institutes and enterprises throughout Europe and is supported as an "Integrated Project" with 13 million Euros of funding by FP6 of the European Commission. The department is also one of 11 members of the multidisciplinary research program

URRC (Uppsala RNA Research Center), an excellent initiative in biology funding that should encourage synergy with programs in ICM and elsewhere.

20.1.5 Opportunities for renewal and emerging science

RNA biology represents one of the most spectacular areas of advance in life sciences over the last decade. The department is well placed to play a role in developing new methodologies in RNA and DNA synthesis, structure determination, and potential use in diagnosis of disease and human therapy. Future plans in this direction include the development of new strategies to improve the delivery and stability of small RNAs, and the design and synthesis of small molecules to target cellular RNAs and modulate their function.

20.1.6 Actions for successful development

The committee felt that to maintain the high current standard of his research, the head of department should define his future research directions in a manner that takes more account of the biological problems under study in his immediate research environment. The desire for more senior staff in this department might be easier to satisfy if teaching responsibilities were better developed. The possibility should also be studied that in a future reorganisation of biology departments, Bioorganic Chemistry be incorporated as a program into ICM.

20.2 Department of Cell and Molecular Biology - ICM

20.2.1 General assessment

ICM is a relatively large department of about 115 staff, and comprises 6 programs, held together by a departmental head who performs his task well and appears to be widely appreciated by his colleagues. Much work being pursued within these programs is at the forefront of research in molecular biology and made a very good impression on the panel. Synergies between these programs do exist but seemed to the committee to be capable of much further development, including in some cases between groups within the same program.

The Structural Biology program comprises 4 professors, a lecturer and a research assistant and is responsible for about 16 PhD students. The program is highly focused on the search for potential drug targets in *Mycobacterium tuberculosis* and the development of X-ray crystallography and computational methods and their application. Four professors, an emeritus professor, an associate professor and two assistant professors, direct the research of 27 people, subdivided into 8 groups that constitute the Microbiology program, in large part oriented towards RNA biology and antibiotic resistance. Molecular Biophysics is a multidisciplinary group of 19 people, of whom two - including

one professor - are permanent, that develops new approaches to structural biology using X-ray lasers and performs computer simulations of protein folding. The Molecular Biology program of about 14 people studies the mechanism of protein synthesis and develops systems biology approaches. It is directed by one professor and an assistant professor. Molecular and Cellular Biology (14 people) comprises two professors and an assistant professor and is oriented towards neurobiology, with a second theme devoted to eukaryotic RNA biology. Finally, the Molecular Immunology program, comprising about 10 people, is directed by a professor and an associate professor, and works on allergy research and different aspects of rheumatoid arthritis.

20.2.2 Quality of research

Considered as a whole, ICM conducts research of an internationally high standard. Three programs, in particular, were considered by the committee to be clearly of world-leading research quality, those of Structural Biology, Biophysics, and Molecular Biology. The program in Microbiology was of an internationally high standard, particularly with respect to the research projects centered on the role of small RNA molecules. Molecular Immunology was considered to perform research of an internationally recognised standard, but doubts were expressed as to whether ICM offers an ideal environment for this program. Similar questions were raised with respect to the program on Molecular and Cellular Biology, which conducts research approaching an internationally high standard, but part of which (neurobiology) appears to be not ideally located for optimal interactions with related research. The panel chair declared a conflict of interest with respect to the Molecular Biology program and did not participate in this part of the evaluation.

20.2.3 Research environment and infrastructure

In general, most programs have well developed systems for internal and external seminars, and a good seminar program is available at department level. Local collaborations were considered to be capable of considerable improvement, but particular note must be taken of the highly beneficial effect that the URRC network has exerted on local collaborations. Structural Biology may be noted for having instituted a good internal seminar-retreat program. The arrival of a new research assistant in this unit to study structural aspects of protein synthesis has been beneficial not merely for the unit itself but also in promoting strong collaboration with the Molecular Biology program. The Molecular Immunology program has clearly spent time and effort in developing contacts with clinical research in the university, particularly important to their research projects.

20.2.4 Networks and collaborations

Structural Biology has been awarded direction of the SSF financed RAPID centre, which brings finance and is, furthermore, a kingpin of national and international collaboration. The program is part of the EU FP6 Integrated project “New medicines for Tuberculosis”. The Molecular Biophysics program is particularly remarkable for the multitude of international collaborations, international visitors and joint research grants, and obtained a Center of Excellence Award by the Swedish Research Council 2005. The Molecular Biology program has succeeded in obtaining substantial NIH funding. ICM is particularly well represented among the participants of the URRC network, to which it contributes three programs. Microbiology participates in 3 EU networks: BacRNAs (regulatory RNAs in bacteria), FOSRAK (regulatory RNAs in all kingdoms) and EAR (antibiotics and bacterial fitness).

20.2.5 Opportunities for renewal and emerging science

The understanding in recent years that RNA plays fundamental, previously unsuspected roles in cells has led to an explosion in RNA research. Three programs in ICM: Molecular Biology, Microbiology and Structural Biology, and part of the Molecular Cell Biology program (all participants in URRC), are strongly developed in this area and well placed to make further important contributions.

In addition to the further development of structural biology approaches to identify targets for drugs directed against tuberculosis, which is potentially of considerable therapeutic importance, the development within the Structural Biology program of molecular dynamics simulations offers exciting prospects in understanding ribosome function and the mechanism of enzyme catalysis. A major thrust in the Molecular Biophysics program is directed at obtaining atomic resolution structural information from single molecules by X-FEL, which, if successful, would have a major impact on structural biology. Many aspects of protein synthesis are still poorly understood, particularly those associated with large conformational changes in the ribosome. Powerful tools are already in place in the Molecular Biology program to study these steps, and major progress in this area can be expected. Within the same program, the development of systems biology modeling coupled to experimental verification of predictions has been ahead of its time and has an exciting future; it can be applied to many aspects of bacterial growth, and should lead to enhanced understanding of bacterial adaptation to surroundings.

20.2.6 Actions for successful development

Current SFF support for the RAPID program terminates at the end of 2008. Every effort should be made to maintain financial support for this program which, in spite of an orientation towards drug discovery, cannot readily ob-

tain direct support from industry. An aspect of the activity of the Molecular Biology program that merits strong support is systems biology. This needs support at several levels: equipment, consumables and personnel. A recruitment to this program would strengthen this research and is considered a priority by the panel. A major part of the research activity of the Molecular and Cellular Biology program, Neurobiology, appears to suffer from a marginal critical mass and a sub-optimal environment. The panel raised the question of whether this activity might not be better served by relocation. The research of the program on Molecular Immunology was thought to be handicapped by the relative isolation of these groups, and the committee questioned whether the current environment is optimal for these research projects, which have a marked clinical orientation. The future of this program might be reconsidered in the context of the overall development of immunology in the university. If it remains in ICM, the program should be encouraged to develop stronger links with other programs, such as Structural Biology. Alternatively, the possibility should be considered that a more favorable environment might be provided by integration into the medical faculty.

20.3 Department of Evolution, Genomics and Systematics - IEGS

20.3.1 General assessment

The panel was very impressed with the department, particularly the synergies and inter-program collaborative links. It was felt that this reflected the high degree of leadership of the previous and the newly appointed Heads of Department in encouraging collaborations and diverse approaches to research programs linked by their common but, globally, unique orientation to evolutionary questions. A very significant contribution is provided by the location itself. Its size and facilities, such as a shared canteen, encourage discourse and the initiation of collaborations. There are also strong PhD and post-doctoral training programs. There are joint seminar programs. There are interdisciplinary and multi-disciplinary research collaborations providing significant added value. All of these positive features are reflected in the enthusiasm and commitment of the researchers working at all levels within the department.

The Molecular Evolution program consists of 25 people including 3 professors. The program shows strong and imaginative leadership despite having been set up relatively recently (2000). The research environment (consisting of a cluster of linked programs) clearly facilitates the synergies between this program and others with joint input on metagenomics, the establishment of the joint sequencing and genotyping facility and the Centre of Excellence in Evolutionary Genomics (2005-2010). The program has significant external

funding and a high productivity rate, which will ensure maintained external funding in the future.

The head of the Evolutionary Functional Genomics program (a group of 14 people) is a relatively recent appointment (2003). The group includes a professor, 1 associate professor and two researchers. The research focus is quite broad including studies on different examples of the genetic basis of adaptation, the evolution of plant genomes and the fate of duplicated genes following polyploidisation, and adaptive variation. A key approach in these studies is association mapping, which in plants may take long periods of time, especially in species such as spruce. The synergies within the group are strong and provide a vibrant interaction between the outputs of genetic mapping and population genetics that should provide novel insights into some of the relatively big questions in the evolution of plants.

The research in the Evolutionary Biology program consists of the activities of 5 research groups, four of which are exclusively funded by external money. The program makes a very strong effort to attract international members, particularly at post-doctoral level. There are also a significant number of PhD students. The program is broad, covering studies of positive and negative selection of non-coding DNAs and the evolution of RNA-coding genes, bird genome projects, comparative genomics, QTL mapping of behavioural genes in birds, natural variation and ancient DNA.

There are three groups in the Physiological Botany program including 1 professor, 2 senior lecturers, 1 research assistant and 5 PhD students. The program has benefited from recent appointments of junior faculty. The program is active in setting up technology platforms to assist the progress of their research and those of others working on plants within the EBC. There are good links to international collaborators, and strong links to other groups in Sweden working on conifers.

The programs on Systematics, although traditional, have made and are continuing to make significant contributions to systematics. Clearly the research has a very strong international component, and significant outreach as evidenced by the provision of funding of three positions over 30 years for compiling a complete description of all the eucaryotic species of Sweden.

20.3.2 Quality of research

The work on Molecular Evolution was judged to be top quality and world leading. An excitement about the science being done was clear in the presentations. Much of the work described focused on an excellent balance between wet and dry analyses, which has allowed really unique interpretations of the origins of mitochondria from prokaryotic endosymbionts and complementary studies relating to the evolution of eukaryotes.

The work on Evolutionary Functional Genomics was considered as of an internationally high standard, particularly the studies of the consequences of

polyploidisation in *Capsella* and the studies of different regions of gene flow between species. The work on adaptive traits and phenology in spruce takes advantage of international resources to study adaptation in a tree species important to Scandinavia and represents a good example of the strong international collaborations within the program. It was felt that there were some limitations to the study of the evolution of flowering time and the role of perception of photoperiod, especially when the approach involves comparisons of two very diverged species. While comparative genomics of this type may work well for microevolution, as in the Brassicaceae, the species planned to be considered are too diverged and inappropriately placed phylogenetically for their comparative functional genomics to be truly informative, in terms of responses to photoperiod, because these traits are likely to have evolved independently.

The work in the Evolutionary Biology program was considered to be top quality and world leading. The imaginative use of comparative genomics, QTL mapping and methods to amplify very small amounts of DNA to address interesting biological stories was particularly commended. It was felt that the questions addressed, although very interesting and eminently sellable, were relatively small questions and that, with the resources, expertise and imagination available in the program, efforts could be made to address some evolutionary biology topics in more depth.

The research output in Physiological Botany was considered to be of an internationally recognized standard. It was felt that the publication rate had been relatively low, but that the new directions introduced by the recent appointments should effectively renew the program and provide it with vibrancy and ensure productivity.

The research approach in Systematic Botany is traditional and, as such, of an internationally recognized standard.

20.3.3 Research environment and infrastructure

The research environment is excellent. There is good evidence of constructive collaborative interactions within IEGS and within EBC. The Molecular Evolution program has benefited from the assignment of positions to junior faculty and the extra money from the Centre of Excellence grant. There has also been a strong encouragement for the development of shared facilities, which ensure that work is undertaken most efficiently and with appropriate expertise. Examples include: bioinformatics, sequencing facilities, and a vibrant seminar program.

For Evolutionary Functional Genomics, local collaborations (within EBC and with SLU) are strong. International collaborations are also strong especially in the area of population genetics. The teaching and training offered within this program are strong.

The research environment in Physiological Botany was considered to be very strong, and within the program, innovative adjustments to the infrastructure, particularly the establishment of technology platforms and transformation facilities for conifers, represented real organizational advances that should guarantee future economy of effort and productivity in the challenging areas of research addressed by the program.

The infrastructure in the Systematic Biology programs is good and publication output is excellent. The students are knowledgeable and very enthusiastic.

20.3.4 Networks and collaborations

The networks for Molecular Evolution, Evolutionary Functional Genomics and Physiological Botany are strong both locally and internationally. The Evolutionary Biology program has very strong networks nationally and internationally both at the professorial level and for junior faculty. The networks for the Systematics programs are undoubtedly excellent, since this is an essential component of this type of research.

20.3.5 Opportunities for renewal and emerging science

The big questions in Molecular Evolution concern the degree of vertical inheritance and the degree of horizontal transfer in the evolution of prokaryotes leading to the emergence of eukaryotes. These are challenging but immensely important evolutionary questions. Based on recent performance, it is likely that the future work performed to address these questions will be of top quality.

Work by junior faculty in Molecular Evolution, on the analysis of the cell cycle in Archea and the resemblance of this to eukaryotic chromosomal replication and cell cycle, shows particular promise and represents an informative contribution to understanding the emergence of eukaryotes, despite enormous technical difficulties in working with these species.

The vision of the big questions that the Evolutionary Functional Genomics program could address was clear. The role and influence of polyploidisation is an extremely significant, but under-researched question in plant biology. The approaches proposed in this program benefit enormously from the combination of population genetics, functional genomics and evolutionary biology, and offer a good chance of providing answers, at least for specific examples.

The ideas for maintaining the quality and the renewal of activities in the Evolutionary Biology program were top class. Much thought had gone into the considering the best objectives for future research and the most imaginative ways to use methods, tools and resources to realize these objectives. The QTL mapping of behavioral traits in birds is a clear example of this careful planning. The quality and enthusiasm of the junior faculty in this program was also evident.

The new program in Physiological Botany on patterning of root vasculature has identified exciting new functions for genes previously associated with polarity determination in leaves. The epigenetic focus addressing the role of heterochromatin in maintenance of the shoot apical meristem is also promising. EvoDevo is an emerging field of considerable importance. This program recognized very early the importance of functional studies in combination with more classical evolutionary analysis to understanding the evolution of development. The future focus of this program on the evolution of development of reproductive morphologies and cambial development is timely and should ensure that this program will make significant contributions the field of physiological botany.

There is no doubt that the programs of Systematic Botany and Systematic Zoology will be enhanced significantly by their merger into a single program of Systematic Biology.

20.3.6 Other issues

It was clear from the descriptions offered and discussions with students and post-docs that the training offered in all the programs of the Department is broad, well organized and encourages important international participation.

20.4 Department of Physiology and Developmental Biology - IFU

20.4.1 General assessment

Physiology and Developmental Biology is a medium-sized department that consists of four subdepartments: Developmental Biology and Genetics, Comparative Physiology, Environmental Toxicology and Evolutionary Organismal Biology. The department is relatively heterogeneous, and it was felt that synergies between its subdepartments, and between the IFU and other departments in the EBC, are capable of further development. The following summary makes clear the diversity of research foci and approaches: The subdepartment of Developmental Biology and Genetics comprises a group of 10 people, including two professors and one associate professor. It focuses on epigenetics, which is currently a rapidly developing and exciting area of biology. The subdepartment of Comparative Physiology consists of 12 people, including two professors, three associate professors, and one assistant professor. There are research projects on immune systems in invertebrates, blood cell differentiation, iron homeostasis and transport, and behavioural neuroendocrinology. The subdepartment of Environmental Toxicology, which comprises 8 people, half of them women (the highest proportion in any of the departments visited by the panel), focuses on ongoing projects concerning the

effects of pesticides on neuron development and behaviour (using mouse, bird, frog, and fish models). The subdepartment of Evolutionary Organismal Biology, finally, consists of one professor and one assistant professor. Research focuses on the evolution of tetrapods, especially on their skeleton and muscle apparatuses.

20.4.2 Quality of research

The subdepartment of Developmental Biology and Genetics does world-leading research. The group has made seminal contributions, especially on the role of imprinting and, with the recent recruitments, is set to continue being an important player in the field of epigenetics. The subdepartment of Comparative Physiology exhibits a great deal of variation among and within its research groups, from excellent work on immunity systems in invertebrates at an internationally high standard to work of an internationally recognized standard in some other units. The subdepartment of Environmental Toxicology also was considered to be of internationally recognized standard. However, the fact that three recruitments could be made in this department in 2007 demonstrated the great importance of toxicology, the fact that support was ensured and that the program would be strengthened in the near future. It was also felt that the links between Comparative Physiology and Environmental Toxicology and the other two subdepartments in the department of Physiology and Developmental Biology, as well as other groups in the EBC, will be strengthened now that some comparative physiological and toxicological projects will use the zebra fish and the three-spined stickleback as models (species that are also important models in developmental biology). The Evolutionary Organismal Biology program does top-quality research, and the panel also saw enormous potential for synergistic interactions between this subdepartment and the department of Evolution, Genomics, and Systematics.

20.4.3 Research environment and infrastructure

The research environment and infrastructure at the IFU are very good.

20.4.4 Networks and collaborations

The IFU is in the process of reorganizing its PhD student training (currently still organized by subdepartment), and one goal might be to achieve more synergies with the training opportunities offered at the EBC. Annual common student conferences at IFU and EBC already exist, and a joint seminar series at IFU should further help develop an environment conducive to research in comparative physiology and developmental biology. The panel felt strongly that junior researchers in the subdepartment of Developmental Biology and

Genetics would benefit from more local interactions (including at, but not limited to, the EBC) in addition to that subdepartment's outstanding international network from which they obviously benefit.

The subdepartments of Comparative Physiology and Environmental Toxicology have collaborations mainly with researchers in pharmaceutical biosciences, medicine, and chemistry and there are also formalized interactions among toxicologists (and their postdoctoral fellows and students) via the "Toxicology Forum."

The subdepartment of Evolutionary Organismal Biology has excellent international connections; local collaborations are also developing, and the subdepartment is contributing key courses in organismal biology, such as an animal bauplan course, which is especially important in light of the new direction that systematic biology is taking at Uppsala.

20.4.5 Opportunities for renewal and emerging science

The IFU is heterogeneous in research foci, research group size, age structure of staff, and extent to which the potential for local synergies in the EBC is realised. However, the groups working on epigenetics and tetrapod evolution clearly are benefiting from rapid technical progress in their fields, and there are exciting prospects for an increased understanding of the role of chromosomal networks in governing nuclear architecture and of the evolution of skeletons and musculature in vertebrates. The EBC constitutes one of the largest and strongest groups of evolutionary biologists in Europe, and the panel felt that the subdepartments of Comparative Physiology and Environmental Toxicology might benefit from considering an evolutionary perspective to some of their research projects so as to gain the greatest possible advantage from the accumulated local expertise. Of the eight faculty and junior faculty in Environmental Toxicology, three will be recruited in 2007, which presents a great opportunity for the development of more collaborative research.

20.4.6 Actions for successful development

The composition of the IFU might be reconsidered in the context of the overall development of epigenetics, physiology, toxicology, and systematics at the University of Uppsala.

20.5 Department of Ecology and Evolution - IEE

20.5.1 General assessment

The department of Ecology and Evolution is large with about 110 scientists employed. It seems to be coherent with a good and visionary leadership, excellent collaboration with regard to PhD and Masters programs and a stimu-

lating and positive atmosphere. We strongly recommend getting the different programs physically united at the EBC, and expect that this will further improve the already very good collaborations between the different groups in the department, and also improve the combination of molecular approaches with studies of natural populations in a well-defined theoretical framework.

The program in plant ecology has 4 professors, 2 associate professors, 2 assistant professors, several research associates and post-docs and a large number of PhD students. They are not yet placed physically at the EBC, which would be beneficial for extending their already very active collaborations with other programs at the EBC. The program has a dynamic leader and their scientific research spans a wide range of activities that concern biological organization (from DNA to ecosystem level) and methods (from field studies to analytical and theoretical modelling) and from studies of plant adaptation in genetically well-characterized model species to ecosystem processes and conservation biology. One of the projects presented aimed at studying adaptation to environmental gradients, combining field with laboratory studies using molecular methods.

The animal ecology program consists of four professors, three associate and three assistant professors, and four postdocs in addition to a large number of PhD students. The program has focus areas in sexual selection, speciation and life history evolution using different animal models. The program seems to be very active and stimulating, with a good age structure, many newly-recruited faculty and, not least, a high number of excellent scientists. A good balance between theoretical models and empirical work exists.

The Limnology program consists of one professor, four associate professors, two assistant professors, six research associates and two post-docs. The program has several focal areas, including microbial ecology, lake ecosystem research and population and community interactions. The microbial ecology group studies the role of microbes in aquatic food webs and biogeochemical cycles, and includes a microbiomics group that aims at developing and applying biomarker approaches to analyze microbial communities, combining expertise from different biological disciplines. The lake ecosystem group studies the impact of climate change on aquatic ecosystems, using long-term data from Lake Erken.

The population and conservation biology program has two professors, one assistant professor, nine research associates and two post-docs. The program focuses on the study of biodiversity and evolution in natural populations using molecular and quantitative genetic analyses, using bird and amphibian species as models of microevolutionary processes. The study of adaptive variation along environmental gradients is a successful example of the work of this group.

20.5.2 Quality of research

Some of the projects of the plant ecology program are of internationally very high standard, combining the latest state-of-the-art molecular technology with competent field work with the aim of identifying the genetic basis of adaptation. This work is approaching a world leading standard in the study of plant adaptation. The quality of the animal ecology group is very high, and the group is internationally leading in several of their focal areas. The research of the Limnology program is internationally recognized and in some parts of internationally high standard. The work of the population and conservation biology group is internationally recognized and for some parts of high international standard.

20.5.3 Research environment and infrastructure

The EBC is unique as a research platform, and the improvement of the infrastructure of this visionary center should be strongly supported as it represents a very competitive research environment in evolutionary biology that is internationally leading and provides a unique basis for training and research at the cutting edge of the field. Particularly the infrastructure of the center allows for the integration of molecular tools into ecological and population biology research.

The plant ecology group has an attractive age profile, appears coherent and has excellent collaboration locally, at a national scale and internationally. There seem to be lively seminar activities and a good and inspiring atmosphere for PhD students. The animal ecology group has very good cooperation with other groups internationally, and extended interactions with respect to genomics and population genetics with other groups at the EBC are expected to further strengthen their profile.

The Limnology program is not physically part of the EBC. We expect that moving of the group into common facilities with the rest of EBC will strengthen their scientific profile by improving interactions with other groups at EBC.

20.5.4 Networks and collaborations

The plant ecology program is well connected at national and international levels and has good cooperation with other groups at the EBC. The limnology group is part of several research council-funded networks, including interaction with researchers at SLU in the microbiomics project and with colleagues in Umeå in the LEREC project. The population and conservation biology group is part of several European networks and has strong national and international collaborations.

20.5.5 Opportunities for renewal and emerging science

The plant ecology group would clearly benefit from moving into the EBC to improve connections to the strong research and expertise there in molecular evolutionary biology and the application of molecular tools. Its aim of unraveling the genetic architecture and functional basis of adaptation in plants connects them with other leading groups in the field of studies of local adaptation - and similar goals concerning the study of the genetic basis of adaptation exist in other groups of the EBC. It was felt that the exciting plans for future research in the animal ecology program should to a larger extent include the integration of genomic approaches. A stronger interaction of the limnology program with groups that use molecular techniques and a larger focus on evolutionary processes will benefit the limnology program as part of the EBC. Further interaction of the population and conservation biology program with other groups at EBC would be beneficial, particularly further integration of population genetic and genomic tools is recommended.

20.5.6 Actions for successful development

Extended collaboration of the plant ecology program with the other leading groups at EBC would allow further improvement of the quality of the group and moving physically into the EBC will make this collaboration much easier.

20.6 The Linnaeus Centre for Bioinformatics - LCB

20.6.1 General assessment

The Linnaeus Centre for Bioinformatics is a relatively small, and young, unit with one full Professor, three Associate Professors, one Researcher and some 20 further staff, mainly comprising PhD students. The LCB activity in Bioinformatics and Computational Biology is focused on genetics and genomics and represents a joint enterprise between Uppsala University and SLU, combining programs of independent research with the provision of data warehousing services and services and training in bioinformatics to the biology communities of both universities.

20.6.2 Quality of research

The Centre performs research of an internationally recognized standard, as exemplified by the inclusion of the centre in major international networking activities. The panel would like to highlight the work in computational genetics as particularly exciting.

20.6.3 Research environment and infrastructure

The LCB has a good mix of young scientists and administrative and infrastructure support. As well as providing local servers, the Centre is well connected with national facilities for larger scale computing. Members of the LCB have various links within Uppsala University.

20.6.4 Networks and collaborations

LCB is part of several major national and international networks, including the pan-European, EU-funded, EMBRACE project.

20.6.5 Opportunities for renewal and emerging science

Genomic and post-genomic biological science is responsible for an explosion in the amount of data generated and the curation, warehousing, and analysis of these data is a major challenge. In addition, there is an urgent need for improved database integration and improved tools to allow useful access to these data. In this context bioinformatics is a core activity in any modern centre for biology and, looking to the future development of the local program, the excellence of the work in computational genetics, noted above, stood out.

20.6.6 Actions for successful development

To build on current strengths and to ensure that the LCB makes a difference to biological research within the University there should be a close alignment of bioinformatics activity with the needs of the local biological community.

21. Panel 16

21.1 Department of Earth Sciences

21.1.1 Executive Summary

The Department of Earth Sciences is one of the most complete such academic Departments in Europe, encompassing (i) Air, Water and Landscape Sciences, (ii) Palaeobiology, (iii) Solid Earth Sciences and (iv) Geophysics. Based on productivity and scientific quality, the Department of Earth Sciences is a solid and internationally well recognized department, which usually acts as a coherent unit. It is in a phase of positive development. Several groups within the department are judged to be of very high international standard and several have great potential for future development. The realisation of this potential depends to a great extent on the department's ability to initiate research strategies and common larger projects of high national and international quality.

Through the presentations and discussions, the evaluation panel found a number of common features among the different research groups of the Department of Earth Sciences. Key findings and recommendations of general importance for the future development and management of the department are:

1. The significant budget reductions in the late 1990s and early 2000s led to a decline in scientific production. Nevertheless, the panel noted with satisfaction a very strong positive trend in scientific production and academic recognition, as reflected in publication numbers and citations of almost all of the research staff.
2. There is a need to raise awareness among decision makers of the value of earth sciences to Swedish society. This should be carried out at a national level and should include the preparation of a clear strategy paper for the development of the earth sciences.
3. The Department of Earth Sciences should develop its own strategy document that is linked to the national earth sciences strategy paper. This document should map out a programme that involves improving coordination within the Department and a strengthening of the Department profile. Furthermore, it should ensure compatibility between the level of ambition outlined for the different fields of research and the allocated resources.
4. The panel noted the very friendly environment and good working relationships that exist within the Department. This provides an ideal

basis for increasing internal cooperation. There is considerable potential for improving research productivity and quality by enhancing cooperation within and among the research units. In addition, research could be strengthened markedly by launching a few large multidisciplinary research projects that includes participants from several research groups. Examples could be projects that focus on the Baltic Sea and focussing on CO₂ storage.

5. The Department should strengthen collaboration with other Swedish universities and research institutes. This is particularly important for those groups that lack critical mass and for sub-disciplines in which international-level expertise exists outside the Uppsala University. The collaboration could, for instance, support PhD education by providing improved guidance and networking and altogether supply a superior basis for carrying out international-level research.
6. There is a need to improve the visibility of Departmental research and education relevant to industry. With the growing awareness of environment, natural resource and energy issues, there will be a considerable interest from industry (e.g. the international oil and mineral industries and the water sector) in graduate students and research produced by the department. To exploit fully this potential, the department should further develop partnerships with relevant companies and organisations.
7. Cooperation with the Swedish Geological Survey (SGU) appears to function quite well at personal levels. A recently established cooperation agreement between the Uppsala University and SGU enables more formalised and larger scale cooperation at the institutional levels. Accordingly, the potential for enhancing cooperation is significant both with respect to research and education.
8. There is unrealised potential for bringing in overseas researchers with their own financial support. This may in the long term improve international networks and thus serve as a good basis for future international research projects.

General Comment on Recruitment Policy at the University Level

The Department should have a more transparent policy for distributing resources for PhDs and other time-limited positions such as junior research associates (forskarassistent) among the groups. The number of post-doctoral researchers is quite low. Recruitment of international post-docs should especially be very valuable, especially for small groups. To attract the best scientists, junior research associates should be allocated sufficient resources to recruit PhD students and to extend (in time) their own current four-year appointments to facilitate PhD supervision until thesis completion.

Specific Conclusions and Recommendations; Summary

Following is a summary of the evaluation panel's specific recommendations and conclusions on the quality of research:

- *Surface Hydrology and Climate*: During the period of NOPEX activities, the quality of research was top-class. After reorientation and the loss of modelling expertise the quality is now assessed as being between ***internationally recognised standard*** and ***internationally high standard*** with a high potential for improvements. The panel recommends that the group be strengthened by a full time researcher with modelling expertise.
- *Subsurface Hydrology*: The quality of research is assessed to be ***internationally high standard***. The panel recommends that the group be strengthened by a researcher with expertise in CO₂ storage.
- *Water Resources Management and Water Quality*: The quality of research is assessed to be ***acceptable*** with good potential for improvements.
- *Aquatic Modelling*: The quality of research is assessed to be of ***internationally high standard*** with moderate potential for maintaining this level. Consequently, the department should consider designing a recruitment strategy to maintain and even enhance activities in this research field after retirement of the present professor.
- *Meteorology*: In boundary layer meteorology their accomplishments of this group can be rated to between ***world-leading*** and ***internationally high standard***. Within Europe, they definitely belong to the top quality class. Within two years the group needs a successor for the retiring professor.
- *Glaciology*: The prospect for ice stream research in the Antarctic is especially promising. For the glaciology group to obtain an autonomous status, they need a senior scientist at the professorial level.
- *Paleobiology*: We identify the senior researcher as producing work that is ***world-leading***. The senior researcher's position should be made permanent, and, as one of the small number of outstanding researchers in the Department, he is worthy of rapid promotion to a professorship.
- *Micropaleontology*: The quality of research in this small group is at ***internationally recognised standard***, but it will decline, or remain steady, unless its activities are combined with those of the other palaeontologists. The subcritical size of the micropalaeontology group makes it hard to see how it can reach optimum size and function more actively on the international stage. The best opportunity is to share aims and objectives with the other palaeontologists, and to inject a micropalaeontological aspect into problem-oriented science.

- *Invertebrate Palaeontology*: The work of the group is uniformly of **internationally high standard**, some of it world-leading. There is a prime opportunity for Uppsala to change an internationally strong research group into a world-leading group by combining the micropalaeontology and palaeobiology groups.
- *Deformation Geology and Petrology*: The scientific production of this group is good to very good and its total scientific contribution is considered to be at a level between **internationally recognised standard** and **internationally high standard**. The group has been hampered in utilizing its full potential due to lack of resources, but has already demonstrated its capacity in classical structural geology and analogue structural modelling. Future developments depend on the recruitment of the new professor in petrology and increased laboratory investments.
- *High Pressure Geology*: The evaluation panel had a very good impression of the achievements of the group. Considering the resources available, the evaluation panel was even impressed. The group is regarded to be of **internationally high standard**.
- *Earthquake Seismology*: The research quality of the group is ranked as **internationally high standard**. The evaluation panel fully supports the department's efforts to recruit a Professor of Seismology who will lead Swedish earthquake research. This important professorship will further raise the profile of earthquake seismology, including such secondary effects as tsunamis and landslides, within Sweden. The professorship will have a national and international mandate.
- *Explosion Seismology*: This is an outstanding group involved in a number of extremely important projects. The research of this small group is ranked as '**world-leading**'. The evaluation panel fully supports the Department's efforts to recruit an Assistant Professor in Reflection Seismology.
- *Electromagnetic Geophysics*: The research quality of the Professor of Electromagnetic Geophysics is **world-leading**. Since airborne geophysics plays a key role in investigations of the geology of the Fennoscandian Shield and elsewhere, the evaluation panel recommends that the Department create an appropriate professorship in applied geophysics after the current Professor of Electromagnetic Geophysics retires in five to six years.

21.1.2 Introduction

Formalia

The evaluation took place May 6 - 12, 2007. It included two days of plenary sessions at the university and faculty levels and three days of interviews and on-site evaluation at the Department of Earth Sciences.

The evaluation panel consisted of Professor Michael Benton (University of Bristol), Professor Roy H. Gabrielsen (University of Oslo; Chairman), Professor Elisabeth F. Haggård (Stockholm University), Professor Alan G. Green (ETH Zürich), Professor Atsumu Ohmura (ETH Zürich) and Research Professor Jens Christian Refsgaard (Geological Survey of Denmark and Greenland; GEUS).

The evaluation panel was given optimal conditions for its work. The information meetings, presentations and interviews with the administration staff and scientist at the Department of Earth Sciences were well organised, taking place in an open and friendly atmosphere.

The evaluation panel has only assessed research fields and groups that are likely to have the highest potential for development; and that the Department of Earth Sciences was given the responsibility to select the research fields which are likely best to fit this criterion. Consequently, the panel did not have the opportunity to review/interview several small research groups. There were, however, two exceptions to this: The panel requested short presentations from the Glaciology group (which is in a formative period of development) and the Sediment Petrology group. Both these groups are relevant to the activities of groups formally invited to give presentations

Background

The Department of Earth Sciences was established in 1998 through merger of the former Department of Geophysics, Department of Meteorology and Department of Earth Science. The latter was created in 1994 through merger of the former Department of Physical Geography, Department of Quaternary Geology, Department of Geology and Department of Palaeontology and Historical Geology. It is now one of the most comprehensive earth science Departments in Europe. The Department presently has twenty-one professors, twenty-five senior lecturers/researchers, four lecturers, seven assistant professors (a status rather similar to post-doctoral fellow or research associate), forty-eight Ph.D. students and about three hundred and sixty full-time undergraduates. Including part-time students and students in distance-education programs, the Department is responsible for the education of about 1250 students. The Department operates on a budget of about 120 M SEK per year.

The Department of Earth Sciences has been working with decreasing funds and general downsizing of the scientific and technical staff throughout the 1999-2007-period. Strong restructuring has now been performed, such that the department is able to focus much of its attention on process-oriented research. The entire programme of activities in the Department is now designed to maintain a healthy economy. The Department faces significant new challenges and opportunities over the next few years; many key scientists will soon retire (7 professors to retire between 2008 and 2010) and, hence, there is a major phase of recruitment ahead (8 positions, 7 assistant professors, one researcher).

General significance of the Earth Sciences

Faced with the huge global population increases, climate change and related issues (e.g. such mineral resources, energy, water, energy, food, health and security), the importance of the earth sciences to humanity has significantly increased recently. Society is ever more aware of the importance of the earth system knowledge, in particular with regard to those issues that relate to, *energy*, management of *energy*, *natural resources* and *environmental change*. The Evaluation panel has actively sought authoritative strategic documentation on the earth sciences in Sweden, but has not been able to find it at the national and university levels. Nevertheless, the importance of the earth sciences to European society is clearly expressed in recent, important documents, such as the final report of the European Strategy Forum on Research Infrastructure (ESFRI).

Concerning the *environment*, *natural hazards* and *natural resources*, the ESFRI report states that “the earth system research focussing on the promotion of sustainable management of the natural and human environment and its resources”. It goes on to say that it is essential “to analyse and understand the past, and to observe, monitor and analyse the present, in order to predict the future developments of the earth’s system (atmosphere, oceans, land surface, cryosphere, and human activities)”.

Concerning *energy*, the same report states that “unless Europe can make energy production and use more competitive in the next 20 years, around 70% of the EU energy requirements (compared to 50% today) will be met by imported products. In parallel, if nothing is done, world energy demand and CO₂ emissions are expected to rise by 60% in 2030.”

The evaluation panel endorses these statements. It also emphasises that much of the present activity in the Department of Earth Sciences in Uppsala can contribute to resolving the identified. However, the evaluation panel stresses that, as an academic research institution, the Department of Earth Sciences has a particular responsibility for basic research aimed at improving our understanding of the basic earth system processes.

21.1.3 Evaluations and Recommendations

Air, Water and Landscape Sciences

The Department’s programme on Air, Water and Landscape Science involves six research groups:

- Surface hydrology and climate
- Subsurface hydrology
- Water resources management and water quality
- Aquatic modelling
- Meteorology
- Glaciology

Each group has developed its own research programme. There is some co-operation between the first three groups in the sense that some researchers participate in the activities of several groups, but there is presently no overarching research project that ties the entire programme together and facilitates internal collaboration.

The considerable staff reductions over the past decade have put many research groups in a difficult position with respect to lack of critical mass to preserve the breadth of the research programmes. The coming retirements of key researchers may further worsen the vulnerable situation for many of the groups unless appropriate staff replacements are made.

Surface Hydrology and Climate

General assessment

The group today comprises three professors, of whom two are also involved in subsurface hydrology, and five PhD students. During the past few years the group has lost its two high-quality modelling experts, who left for permanent positions at the University of Stockholm and the University of Oslo. One of them is still associated in a 20% position. In addition, the group has a world leading visiting professor for a one-year period.

The group was in the 1990s running the NOPEX/WINTEX land-surface field experiment. This was a major international research project involving many strong international research groups. Since then the group has reoriented its focus from field experiments towards regional and global scale hydrological modelling. The WASMOD-M model used by the group is one of the few efforts to make global scale water balance modelling. A key challenge in this respect is the poor quality of global datasets. The new developments include parameter estimation, model validation and uncertainty analysis. In addition, new methodologies have been developed to downscale global and regional climate information, especially precipitation.

The present research is relevant for regional and global scale water resources assessment, in particular with respect to climate change impacts.

Quality of research

The NOPEX/WINTEX research experiments were significant contributions to international climate research and may be categorised as being 'top-quality'. It is more difficult to assess the quality of the research in the new field of global scale hydrological modelling, since the first publications from the group in this new field have just emerged. We assess it to be currently between internationally recognised standard and internationally high standard with potential for future improvements.

Research environment and infrastructure

Most of the research now is modelling and does not require specialised equipment.

Networks and collaboration

The group has collaboration with international research groups. Nationally, there is a considerable cooperation with SLU and some other Swedish universities. However, there appears to be little or no cooperation with the SMHI/Rosby Centre, which is one of the world leaders in regional scale hydrological modelling and among others have established a well-documented model for the Baltic Sea basin.

Opportunities for renewal and emerging science

The group has previously documented its ability to carry out top-class research. It therefore has a potential for improving the quality of the present research when it proceeds deeper into the new research area. However, this may require that the modelling expertise be strengthened again. This research area is crucial for the Department's new research initiative focussing on the Baltic Sea.

Actions for successful development

- A clear research strategy should be formulated. This should include descriptions of fields where the group can contribute with novel research results. One such field could for instance be uncertainty assessments, which in spite of the many sources of uncertainties involved, so far has not been common in global-scale modelling.
- To utilise its potential the group should be strengthened with a full-time researcher with hydrological modelling expertise.
- Collaboration with national research groups should be strengthened.

Subsurface Hydrology

General assessment

The group comprises three professors, of whom two are also involved in surface hydrology, one associate professor and three PhD students. The activities of the group have been strengthened significantly since 2000, when a new associate professor (later promoted to professor) was recruited. The research aims at an improved understanding and modelling for predicting subsurface flow and transport in heterogeneous porous media and fractured rocks as well as transport in multiphase systems. In addition, the group addresses improved ways to estimate groundwater recharge and biogeochemistry. One of the key challenges is how to account for geological heterogeneity at different scales.

The main applications are contaminant transport and remediation, nuclear waste disposal and water supply. A new emerging activity is believed to be geological storage of CO₂.

Quality of research

Due to the relatively new activities the results have only appeared in recent years. The results have been published in top class international journals. We assess the quality to be of ***internationally high standard***.

Research environment and infrastructure

The group has good facilities for conducting field studies, including tracer tests.

Networks and collaboration

The group has collaboration with international top-class research groups in USA in contaminant and multiphase transport. In addition, it has been active in preparing two proposals (one as co-ordinator) for the EU FP7 call in May 2007 and in this way demonstrated its useful European network. The international network in the area of geological storage of CO₂ appears to lack key research groups operating on the Norwegian shelf and in Canada, where important experiments are presently going on.

Nationally, the group has a strong collaboration with the Swedish Geological Survey (SGU) as well as with KTH.

Opportunities for renewal and emerging science

The group has good potential for improving its research and to provide significant research contributions. There is some currently unexplored potential for improving research on geological heterogeneity, and the associated uncertainty assessments, at different scales by establishing stronger collaboration with structural geologists and geophysicists within the Department.

An important limitation is that the group only has two researchers focussing fully on research in subsurface hydrology of which one is devoted to biogeochemistry. It is not possible for one person to maintain and develop state-of-the-art knowledge and networking within a so broad a field, ranging from contaminant transport to CO₂ storage. There is for instance presently such great international attention on CO₂ storage and the real-life projects are so huge that it requires considerable expertise and an up-to-date network to produce research of high international quality. The panel is concerned about the large resources required to produce good quality research within the very broad area that is currently expected to be covered by the group.

Actions for successful development

- The Department should develop a research strategy that ensures consistency between the areas of research that are given high priority and the allocated resources.
- If the range of the present research fields is preserved the group should be strengthened by one additional assistant professor/lecturer.

- The collaboration on geological heterogeneity at different scales with structural geologists and geophysicists within the Department should be enhanced.

Water Resources Management and Water Quality

General assessment

The group comprises two professors, who devote most of their time in other research fields, two associate professors and one PhD student. The field focuses on the application of hydrological methodologies to developing countries, where it is often applied in a broader context that includes socio-economic considerations. The research is typically carried out by foreign PhD students supported by SIDA projects that focus on capacity building at universities in developing countries. This field is believed to be a future growth area for the Department.

The Department activities can be regarded as the natural science input to Integrated Water Resources Management (IWRM), which is the dominating water management approach within Europe (Water Framework Directive) and internationally (UN, WB, SIDA, etc). Research in IWRM is multidisciplinary. IWRM is crucial for all societies.

Quality of research

The research activities appear to be applications of methodologies developed in other research areas and the research publications in this area are so far quite limited. We assess the quality of the research to be *acceptable*.

Research environment and infrastructure

No comment.

Networks and collaboration

It appears that the group does not have much collaboration with strong Swedish research groups (e.g. at Linköping University) or with international research groups dealing with IWRM.

Opportunities for renewal and emerging science

There is a potential for improving the research quality in this field. For example, novel methodologies (e.g. remote sensing) could be developed specifically for data-poor regions.

Actions for successful development

- The Department should seek collaboration with internationally recognised research groups dealing with IWRM. This should not spread the Department's research activities into socio-economic issues, but rather it should ensure that PhD candidates from

developing countries see their own research activities in a broader context.

- Study of natural resources in developing countries with limited infrastructure and databases frequently demands access to remote sensing data (satellite, airborne). Steps should be taken so that such data of high quality and expertise in remote sensing methods are available.

Aquatic modelling

General assessment

The group currently comprises only one professor and four PhD students. The research focuses on the development of process-based quantitative models for lakes, rivers and coastal areas. The principal research involves descriptions of transport processes such as sedimentation, re-suspension, burial, outflow and bio-uptake of nutrients, metals and radionuclides as well as foodweb interactions and structures. It is planned to combine these descriptions with a hydrodynamic model for the Baltic Sea developed by researchers at Göteborg University.

Quality of research

The group has a high publication rate. We assess the quality of the research to be **internationally high standard**.

Research environment and infrastructure

Since most of the group's research concentrates on modelling, it does not require specialised equipment.

Networks and collaboration

For many years, the group has attracted considerable research funds from EU projects that involve the analysis of Chernobyl data. This research includes a strong European network.

Opportunities for renewal and emerging science

The group is vulnerable, because it is dependent on only one permanently employed researcher who is due to retire within a few years; there appears to be no successor in the pipeline, implying that the group will cease to exist when this researcher retires within a few years. Under these conditions, the potential for renewal is assessed to be weak.

Actions for successful development

The Department needs to decide if it wishes to preserve or expand this research field as part of its research strategy. The evaluation panel notes that this research area is critical for the Department's new research initiative that focuses on the Baltic Sea.

Meteorology

General assessment

The meteorology group has concentrated its effort on surface or lower boundary layer processes. Characteristics of turbulence and flux/profile relationships have been the main research activities. In the latter area, members of the group have determined the best flux/profile relationship (Monin-Obukhov functions), which they obtained experimentally and to some extent theoretically. Flux/profile relationships have become increasingly important over the past few years, because they provide the most suitable parameterization for the lowest atmospheric layer in climate models that connect the atmosphere with surface processes.

Quality of research

In boundary layer meteorology, the group's accomplishments can be rated between *world-leading* and *internationally high standard*. The choice of the surface boundary layer as the major research target is apt, because it has been a major strength at Uppsala University over the past half century and it is well suited for a small group. Although studies of the surface boundary layer are concerned technically with small-scale processes, the results of the study have a global relevance, since the boundary layer covers the entire earth's surface.

Research environment and infrastructure

The recent move of the group into investigations of the ocean surface boundary layer is regarded by the evaluation panel as very positive. This step, which is appropriate because of its breadth and depth in terrestrial surface boundary layer research, puts the group in a strategically important position in world climate research; the ocean boundary layer offers ample opportunities for new discoveries. Since the ocean surface covers 70% of the earth's surface, improvements in our understanding of ocean boundary layer processes have the potential to influence directly the quality of global climate simulations. The newly constructed marine observation site at Östergarnsholm is well chosen and the instrumentation optimally constructed. This observation platform will generate a valuable set of data in the coming years. The group has already obtained important new formulations relevant to ocean boundary layer research, such that our understanding of the role played by oceans in the global climate has improved.

Networks and collaboration

The international contribution by the group is expected to remain high. Within the country, specializations are well coordinated. Whereas the group in Stockholm University is concerned with large-scale meteorology and climate change, that in Uppsala University specialises in micrometeorology. The specialisations are complementary. Because the Uppsala group deals

with processes near the earth's surface, there is ample opportunity for the meteorology group to interact with colleagues within their own Department.

Opportunity for renewal and emerging science

The leaders of this group have trained several young and capable scientists who are already discovering important features of the marine boundary layer. We recommend that boundary layer meteorology be continued at Uppsala. The research field can be extended to include the upper boundary layer above the surface boundary layer, such that the essential nature of the planetary boundary layer that connects the earth's surface to the entire atmosphere can be clarified.

Actions for successful development

Within two years, the group will need a successor for the retiring professor. Boundary layer research in Uppsala not only complements meteorological and climatological research within Sweden, but it also contributes to the advancement of atmospheric knowledge on the global scale.

Glaciology

General assessment

Sweden has the world's longest unbroken observations of a glacier (Storglaciären, since 1945), including the seasonal mass balance, surface area, ice volume and glacier dynamics. The country currently has a glacier ice surface of 313 km² and ice volume of 13,6 km³. There is an emerging group of capable young glaciologists at Uppsala. This potential, combined with the traditional strengths of this school in studies of boundary layer meteorology, will create one of the strongest groups in glaciology capable of tackling cryospheric problems related to a changing climate. This group can develop a unique programme on glacier/climate relationships, strong both in theory and experiment, especially because other groups in glaciology in Nordic countries are heavily dominated by the descriptive tradition.

Quality of research

The group has worked with internationally leading glaciologists for the past five years or so. Members of the group have started to publish very good articles in first-rate journals in the area of glacier mass balance, ice core palaeoclimate, ice dynamics and radar glaciology. The prospect for ice stream research in the Antarctic is especially promising.

Research environment and infrastructure

The Uppsala undergraduate education with solid mathematics and physics prepare students well for tackling glaciological questions. This intellectual environment brings glaciology to a scientific level beyond the traditional descriptive treatment.

Networks and collaboration

The research is carried out in collaboration with leading groups, often by taking a junior position. In due time, however, the group will grow to be independent.

Opportunity for renewal and emerging science

The activities up to now have been divided among three directions; surface mass balance/climate, ice core interpretation, and glacier dynamics. In view of the limited size of the group, it is recommended that action be taken for the objectives and future priorities to be identified and clearly stated.

Actions for successful development

For the glaciology group to obtain an autonomous status, they need a senior scientist at the professorial level. In a wider context, strong glaciology is essential for the Swedish Antarctic and Arctic programmes.

21.1.4 Palaeobiology (Palaeontology)

The group is presented in three sections:

- Palaeobiology,
- Micropalaeontology, and
- Invertebrate palaeontology

The Palaeobiology Group in Uppsala is ranked as “internationally high” to “world-leading”, and is in a unique position to develop rapidly. The key priority is to confirm the senior researcher’s position as permanent. Then, with further integration and collaboration, the group of four senior people can develop their shared expertise on the Neoproterozoic and Cambrian evolution of early life in the oceans to the highest possible level. The only other desideratum is a technician to assist with scientific illustration and/or fossil preparation.

Common actions for successful development

- It is recommended that the four palaeontologist groups should maximise their collaborations in publications, grant-getting and joint student supervision and especially to share skills in seeking EU-funding and writing high-profile scientific papers. To signal this, it would be helpful if they indicate their close links as members as one single research groups, without distinguishing “palaeobiology”, “micropalaeontology” and “invertebrate palaeontology”.
- The senior figures need to lead on more major publications rather than being subsidiary authors to strong leaders in institutions elsewhere.
- The groups should work even more closely together, the group of four may be to build a research group to include a larger number of

PhD-students and post.docs and also explore the possibility to obtain more technical assistance.

Palaeobiology

General assessment

The palaeobiology group consists of a senior researcher, a post-doctoral researcher and three PhD students who work on early Palaeozoic arthropods, worms, and other fossil groups, generally with a focus on basal metazoan evolution. The work is very much problem-oriented and multidisciplinary, involving extensive collaborations and publications in highly rated journals.

Quality of research

We identify the senior researcher as producing work that is **world-leading**.

Research environment and infrastructure

As a senior researcher, the leadership of this group is uncertain. The group appears to have the laboratory facilities it needs, with access to an SEM, photographic facilities, light microscopes, and with shared access to other facilities, such as gene sequencing labs, in other Departments in Uppsala. They expressed a need for a lab technician specialising in fossil preparation and/ or illustration.

Networks and collaborations

The lead researcher and his students collaborate exceptionally well with each other, with other colleagues in Uppsala (both in Earth Sciences and in Biology), and with colleagues worldwide. His involvement in the EU Zootaxa programme has been important in bringing wider collaborators and two funded PhD students.

Opportunities for renewal and emerging science

We believe this senior researcher is the key to a renewal and extraordinary opportunity to strengthen palaeobiology in Uppsala. If his position can be made permanent, and if can collaborate with the other three palaeobiologists (micropalaeontology and invertebrate palaeontology groups), they will have a world-beating team. The group would capture a strong theme on palaeobiology of the Neoproterozoic and Cambrian, with a focus on questions about the early phase of animal evolution:

1. Origin of metazoan body plans
2. Molecular genetics and development of form
3. The Cambrian Explosion, timing and meaning
4. Neoproterozoic, Ediacaran and 'Snowball Earth' model

Emerging themes:

1. Genomic aspects of origins of animal body plans
2. More integration of work on Snowball Earth/ Cambrian Explosion

3. Integration between macro- and micropalaeontology

Actions for successful development

- The senior researcher's position should be made permanent, and, as one of the small number of clearly outstanding researchers in the Department, he is worthy of rapid promotion to a professor.
- The four palaeontologists should maximise their collaborations in publications, grant-getting and joint student supervision - especially to share skills in seeking EU funding and writing high-profile papers. To signal this, it might be helpful if they indicate their close links as members of a single research group, without distinguishing 'Palaeobiology' or 'Micropalaeontology' as if they operate independently.
- By working together the group of four ought to be able to build their research group to include regularly four or five postdoctoral researchers, and more than ten PhD students; perhaps even a technical specialist to assist with illustration for scientific papers and fossil preparation/ conservation.

Micropalaeontology

General assessment

The micropalaeontology group is subcritical, with one established scientist and one PhD student. The work so far represents an excellent mix of monographic and problem-oriented research, but it would be immensely strengthened by sharing facilities and activities with the other palaeontologists.

Quality of research

The quality of research is between *internationally recognized standard*, but it will decline, or remain steady, without combination with the other palaeontologists.

Research environment and infrastructure

The group appears to have the laboratory facilities it needs, with access to an SEM, photographic facilities, light microscopes, and with shared access to other facilities.

Networks and collaborations

The micropalaeontology professor collaborates exceptionally well with senior figures around the world, and is engaged in many international projects as a valued contributor. However, we feel that the collaborative role is too often as a junior or subsidiary partner rather than as a leader.

Opportunities for renewal and emerging science

The subcritical size of the micropalaeontology group makes it hard to see how it can reach optimum size and function more actively on the international

stage. The best opportunity is to share aims and objectives with the other palaeontologists, and to inject a micropalaeontological aspect into problem-oriented science.

Actions for successful development

The critical action, we feel, is for all four palaeontologists to work together as a unit and to share experience and their renewed critical mass in building research links and bidding for larger grants.

Invertebrate Palaeontology

General assessment

The palaeobiology group consists of two professors, four assistant professors (one in Belfast), two postdocs, and 11 PhD students; two curators are also present in the associated Museum of Evolution, which is led by one of the professors .

We note the mix of monographic taxonomic work, some of it exceptionally well regarded and highly cited, as well as thematic problem-oriented research, a growing aspect of their work. This mix, roughly 50% to each field, is excellent and to be applauded. Much of the work concerns themes of interest to the public, and a certain amount of this has been transmitted to children and the public generally both through the Museum of Evolution and through outreach lectures.

Quality of research

Each of the lead researchers produces from one to three papers per year, mainly in leading international refereed journals, but some are not always lead or sole authors. Some of the collaborative papers are with their own PhD students, and others are 'equal' collaborations with established researchers elsewhere. The work of the group is all of *internationally high standard*, some of it world-leading. The potential of the group is high to very high, depending on the actions taken.

Research environment and infrastructure

The Palaeobiology Group is strong and well equipped. The junior personnel - curators, postdocs, research associates and PhD students - represent a strong resource for renewal.

The group appears to have the laboratory facilities it needs, with access to an SEM, photographic facilities, light microscopes, and with shared access to other facilities, such as gene sequencing labs, in other Departments in Uppsala. They expressed a need for a lab technician specialising in fossil preparation and/ or illustration.

Networks and collaborations

The professors collaborate exceptionally well with researchers from other countries, and these collaborators include some of the world stars in their fields, from the USA, UK, Australia, and elsewhere. It would be good to see stronger links, and joint research programmes, with biologists and others in Uppsala, and these links are already being established in the area of developmental biology. We can see the potential for even better collaborations in the future.

Opportunities for renewal and emerging science

As indicated above, there is a prime opportunity for Uppsala to change an internationally strong research group into a world-leading group by combining the micropalaeontology and palaeobiology groups. This would mean there would be four senior figures, plus many junior positions, all of them working on themes relating to the Neoproterozoic and Cambrian, the origin of animals, and other key themes in palaeobiology

Actions for successful development

- The senior researcher's position should be made permanent, and, as one of the small number of clearly outstanding researchers in the Department, he is worthy of rapid promotion to a Professorship.
- The four palaeontologists should maximise their collaborations in publications, grant-getting and joint student supervision - especially to share skills in seeking EU funding and writing high-profile papers. To signal this, it might be helpful if they indicate their close links as members of a single research group, without distinguishing 'Palaeobiology', 'Micropalaeontology' and 'Invertebrate palaeontology' as if they operate independently.
- The senior figures need to lead on more major publications rather than being subsidiary authors to strong leaders in institutions elsewhere.
- By working together the group of four ought to be able to build their research group to include regularly four or five postdocs, and more than ten PhD students; perhaps even a technical specialist to assist with illustration for scientific papers and fossil preparation/conservation.

21.1.5 Solid Earth Geology

The Solid Earth Geology Group includes several integrated research fields. "Deformational geology" which includes deformation processes at all scales, halokinesis, regional tectonics and the development of regional-scale fold-and-thrust belts and shear zones of the Svecofennian crust were, particularly presented and discussed. In its presentations, the group displayed an aware-

ness and concern about the balance between the longterm research on basic geological structural processes and the application of its result for the industry and the society in general.

The group has been through a period of strong reduction of financial and human resources. It has been able to survive this difficult time and still keeping a high scientific standard and production. This is the best measure for its future potential, if increased resources would be at the disposal of its scientists.

Deformation Geology and Petrology

General assessment

The group comprises two professors and two senior lecturers involved in mineralogical petrological and tectonic research. One professor who will retire shortly will not be replaced. Four PhD students are affiliated with the Deformation Geology group. There is no technical staff to serve in the Hans Ramberg Structural Laboratory. One professor of petrology is scheduled to join the Solid Earth Geology Group in the autumn of 2007.

The Deformation Geology Group uses data acquired through geological field studies, geophysical methods (potential field and reflection seismic data) and analogue mechanical experiments. The group does not, however, include in-house numerical modelling expertise.

The group builds on the tradition of experimental structural geology established by the late Hans Ramberg. It has two centrifuges in its possession, one of which is unique in the world, offering the possibility to work with effectively high gravity fields. This centrifuge has been developed to include other parameters, such as differential tectonic stress and temperature. Traditional equipment for sandbox experiments (including a surface laser scanner) has been acquired. The group members employ the analogue mechanical equipment as a supplement to their field studies in structural geology and tectonics, although the use of the centrifuge seems to have diminished over the years.

Quality of research

The group performs very solid research in structural geology and tectonics in the tradition of the Uppsala University, and has a strong focus on brittle deformation as well as ductile shear zones and igneous and metamorphic petrology. Its ability to combine field data, geophysical data and analogue experiments is appreciated by the evaluation panel. The group members have also engaged in the study of salt tectonics processes with particular emphasis on deformation processes at shallow levels and the surface. This is of particular interest for the petroleum industry. In this field, the group has gained world-wide recognition.

The Deformation Geology Group is good to very good and its total scientific contribution is considered to be at a level between *internationally recognised* and *internationally high standard*. The group has been hampered in utilizing its full potential due to lack of resources, but has already demonstrated its capacity in classical structural geology and analogue structural modelling.

Future developments depend on the recruitment of the new professor in petrology and increased laboratory investments.

Research environment and infrastructure

The evaluation panel encourages the combined use of field study, geophysical data and analogue modelling. Future studies would benefit from enhanced use of numerical modelling methods. The group has at its disposal a relatively well-equipped structural laboratory. Mainly due to lack of funding and technical support, the equipment of the laboratory has, however, not been developed to the standards that distinguish many modern structural laboratories. The capacity of the Hans Ramberg laboratory large centrifuge is unique. Nevertheless, utilization of the centrifuge facilities is somewhat unclear and is likely to need further development. It is recommended that the group should itself evaluate the potential of this equipment and design a plan for the development of the structural laboratory as a whole. From experience gained at world-leading structural geological laboratories, it is considered difficult to upgrade the laboratory facilities to such standard without the employing appropriate technical staff.

Networks and collaboration

The Deformation Geology Group has good national collaboration, particularly with the University of Lund (isotope age dating) and the Geological Survey of Sweden. The deformation geology group attracts research students from areas like Germany, Italy, India, Spain, France and Eastern Europe. The Deformation group has access to a wide, and well-established, network of international research partners in Europe and overseas.

Opportunities for renewal and emerging science

- The group has already demonstrated its capacity in classical structural geology and analogue structural modelling. Future developments depend on the recruitment of the new professor in petrology.
- The ambitions for the structural laboratory need to be considered in the light of the possibility to expand technical support staff capacity.

Actions for successful development

- A clear research strategy, where the future role of the structural laboratory is considered, should be formulated.
- The strategy should be brought in harmony with the possibility to enhance the level of technical support in the laboratory.
- The group will be strengthened with a new professor in petrology.
- The possibility to obtain increased external (industry) support should be considered.

High Pressure Geology

General assessment

The High Pressure Geology Group includes one professor, one associated professor (part-time from physics), one professor emeritus and two PhD-students. Over the years, the group has been reduced from a high of fifteen people. It has recently lost its last technician. Good general support is now given from the mechanical workshop, but according to plans, the workshop is to be closed in five years. It is the opinion of the evaluation panel that the group is approaching a subcritical size.

The High Pressure Geology Group works on challenging problems that are important for understanding the dynamics of the earth's deep interior. It focuses on the physical characteristics of the lower mantle, the core and the transition between the two (i.e. the so-called D'' layer). This field of research presently gains great interest in the international geological and geophysical research communities, such that the contributions of the group are highly relevant at this time.

Quality of the research

The group has had a solid scientific production of publications and students. Its publications are well cited, The evaluation panel had a very good impression of the achievements of the group, and considering the resources available, the evaluation panel were even impressed. The group is regarded as ***internationally high standard***.

Research environment and infrastructure

The group works within an extensive national and international network. Good cooperation is established with seismology and material science at the Uppsala University. The evaluation panel, however, expects to see even more frequent publications in collaboration with seismologists/geophysicists in the future. The group to a large extent maintains its own equipment with support from the university mechanical workshop and even develops its own equipment to some extent.

Networks and collaboration

The group maintains a very good network inside the Uppsala University, nationally and internationally.

Opportunities for renewal and emerging science

It is considered likely that the group's contributions in interpretation of seismological data and its studies of conductivity will be of increasing importance. The evaluation panel also endorses the work the group performs in material science. To utilise fully this potential, however, computational capacity and advanced numerical modelling methods will become important. Because of

its small size, the group is very vulnerable. Strengthening the group should be considered by the Department.

Actions for successful development

- A clear research strategy, in which the future role of the high-pressure laboratory is considered, should be formulated. This strategy should consider how sufficient technical support for the laboratory can be secured.
- Since the group is on the edge of becoming subcritical in size, measures should be taken to make it less vulnerable.
- Research involving internal collaboration with geophysics, seismology and material science groups should continue.

Sedimentary petrology group

General assessment

The Sedimentary petrology group consists of one professor and four PhD students (one recently graduated). A presentation by this group was originally not planned, but a presentation was eventually given at short notice and at the request of the evaluation panel. The group studies clastic reservoirs and reservoir quality. It particularly focuses on the relation between diagenetic processes and sequence stratigraphy, with particular reference to the effects of sea level changes and pore water chemistry.

Quality of research

The presentation gave a good overview of the principles of sequence stratigraphy, but there was not enough time to obtain sufficient detail to make a solid assessment about the scientific performance and potential of the group.

Networks and collaboration

In response on questions from the panel, the sedimentary petrology group was said to have a very large international network and contact with a numerous oil companies in many countries.

Opportunities for renewal and emerging science

The evaluation panel cannot assess future opportunities in any detail based on available information, but did remark that there may be potential in the expansion of contacts with the Department's and other geophysics, petrophysics and hydrology groups.

21.1.6 Geophysics

Uppsala solid earth geophysicists are concerned with diverse problems of national and international significance. For a relatively small number of researchers they are involved in an incredibly broad spectrum of research activ-

ities using a wide range of techniques. They are organised in five groups for administrative purposes:

1. Earthquake Seismology
2. Explosion Seismology
3. Electromagnetic Geophysics
4. Geodynamic Modelling
5. Polar Research

Groups 1 - 3 are headed by professors, whereas groups 4 and 5 are headed by a new senior lecturer and an emeritus professor, respectively. With the help of a single assistant, the emeritus professor is presently organising the scientific programme of the forthcoming 33rd World Geological Congress in Oslo, Norway.

It is clear from the large number of joint publications that researchers in the various groups work together; the administrative grouping is not a barrier to cooperative research among the geophysicists. The vast majority of the groups' publications appear in the best earth science journals. For seismologists and applied geophysicists, their publication records and citation counts are excellent.

Approximately 45% of the geophysics unit's financial support originates from external sources. This impressive percentage is the highest of any research unit within the Department.

The following reports are concerned with groups 1- 3.

Earthquake Seismology

General assessment

The Earthquake Seismology group is currently headed by a Professor of Solid Earth Geophysics, who has a very strong background and interest in earthquake and large-scale controlled source seismology. It also includes three research scientists, one research engineer, three guest researchers and four doctoral students.

In addition to installing and running the new seismic network and conducting relatively standard earthquake investigations, the group has made important contributions to our understanding of earthquake scaling relationships, the physics of earthquakes, seismic risk estimation, joint inversion techniques and non-linear seismic tomography. The group has also played critical roles in a large number of international seismic structural and seismicity studies (e.g. Fennoscandian and Baltic Shields, Trans-European Suture Zone, Iceland, Afar Depression in northeast Africa, Iran, Costa Rica, lower mantle)

Quality of research

The research quality of the group is ranked as *internationally high standard*. Despite being the Head and Dean of the Department of Earth Sciences during the most difficult downsizing period between 1999 and 2005, the current leader of the Earthquake Seismology group, aided by the group's research sci-

entists, research engineer and doctoral students, managed to maintain a very respectable publication record. Since relinquishing these positions and as a result of good team work, his scientific output has improved considerably.

Research environment and infrastructure

The Swedish Seismological Service, which is based in the Department of Earth Sciences, is currently undergoing a major revitalisation. Within a few weeks, the installation of a state-of-the-art network of 60 broadband stations will have been completed. High quality data from this network, which covers the entire country, will not only be used to map and monitor seismic activity within Sweden, but will also provide key information for studies of earthquakes throughout the planet. The seismic instruments were purchased with money secured from diverse sources, including the Swedish organisation responsible for nuclear waste disposal (SKB). The long-term costs of running and maintaining the network are covered by funds provided by the Swedish government and the university.

Networks and collaborations

The Earthquake Seismology group is a member of a number of national and international networks. It collaborates with scientists within the Department, within Sweden and worldwide.

Opportunities for renewal and emerging science

The broadband nature and wide aperture of the new seismic network provides exciting opportunities for both focussed and fundamental research.

Actions for successful development

The evaluation panel fully supports the Department's efforts to recruit a Professor of Seismology who will lead Swedish earthquake research. This important professorship will further raise the profile of earthquake seismology, including such secondary effects as tsunamis and landslides, within Sweden. The professorship will have a national and international mandate.

Explosion Seismology

General assessment

The Explosion Seismology Group is one of two applied geophysics groups within the Department. It currently comprises a professor, one research scientist (soon to move to Earthquake Seismology), one research engineer, one guest researcher, one assistant involved in planning the proposed Swedish Deep Drilling Programme and seven doctoral students.

This group has acquired, processed and interpreted high-resolution to crustal-scale seismic data for a wide range of projects of both practical and academic importance. Their multichannel data have provided high-resolution reflection images and velocity tomograms for metallic mineral and

groundwater exploration and investigations associated with active faults, nuclear waste disposal and the sequestration of CO₂. Some of their data have supplied shallow- and deep-crustal images of key geological structures in Europe and Russia (e.g., Siljan Ring, Urals, Caledonides, Iberia). Members of the group have also participated in a number of regional-scale seismic refraction and seismicity surveys (e.g., Fennoscandian and Baltic Shields, Trans-European Suture Zone, Carpathians, Iceland). Finally, they have developed new algorithms for simulating seismic wave propagation in heterogeneous media, seismic tomography and the joint inversion of diverse geophysical data.

Quality of research

The group's research is '**world-leading**', essentially setting new standards for high-resolution imaging of the crystalline crust. Early work by the Professors of Explosion Seismology and Electromagnetic Geophysics demonstrated the importance of basic sills in the composition and structure of the upper crust. Results of this work have had an enormous influence on the interpretation of seismic reflection data recorded at many locations worldwide. The Explosion Seismology group's research has been largely responsible for determining the location of one of the two sites currently being considered for Sweden's nuclear waste repository and is influencing decisions on metallic mineral exploration in Sweden and Canada.

The number of invitations to participate in national and international projects is a solid testament to the global reputation of the group. Nevertheless, the Professor of Explosion Seismology has been the initiator and leader of numerous projects (e.g. many in the Fennoscandian Shield and central Urals and the planned Swedish Deep Drilling Programme).

Research environment and infrastructure

The Explosion Seismology group is the best equipped academic group anywhere for acquiring high-resolution to deep-crustal reflection seismic data. It also has excellent hardware and software facilities for processing and imaging the data.

Networks and collaborations

The group is a member of a number of national and international networks. It collaborates with scientists within the Department, within Sweden and worldwide.

Opportunities for renewal and emerging science

The group is planning a number of exciting projects that deserve the full support of the Department, the university, the funding organisations and industry. They include the 3D seismic mapping and monitoring of CO₂ and potential nuclear waste repositories, applications of 2D and 3D high-resolution

seismic methods in metallic mineral exploration and exploitation, and the Swedish Deep Drilling Programme. Although this is an impressive and complete agenda, the evaluation panel suggests that the Explosion Seismology group become involved in hydrogeological projects being planned by other groups within the Department

Actions for successful development

The evaluation panel fully supports the Department's efforts to recruit an Assistant Professor in Reflection Seismology.

Electromagnetic Geophysics

General assessment

The Electromagnetic Geophysics group is one of two applied geophysics groups within the Department. It currently comprises a professor, one research engineer, one guest researcher and four doctoral students. The research of the Professor of Electromagnetic Geophysics covers an astonishing range of techniques and geological targets. The title "Electromagnetic Geophysics" seriously understates the breadth and depth of the research activities.

The Professor of Electromagnetic Geophysics has been involved in the development of new electromagnetic equipment (e.g. vector VLF and radiomagnetotelluric systems) and innovative algorithms for the processing and inversion of diverse geophysical data sets (e.g. VLF, magnetotelluric, magnetic, gravity, geoelectric, ground-penetrating radar and borehole breakout data). These techniques involve acquiring data from aircraft, across the surface and within boreholes. He has applied his techniques in groundwater and metallic mineral exploration, geological mapping and fracture detection and characterisation. He has also initiated and/or participated in a number of projects aimed at determining the structure and physical characteristics of key geological features (e.g. Fennoscandian and Baltic Shields, North Sea, Transeuropean Suture Zone, Siljan Ring, Iceland, Himalayas, Greece, Canada).

Quality of research

The research quality of the Professor of Electromagnetic Geophysics is '**world-leading**'. He is well known for adopting unique approaches for resolving important problems. Since the Fennoscandian Shield is largely covered by Quaternary sediments, airborne geophysical techniques have been essential for mapping the basement rocks of Sweden. His vector VLF system has been employed for this purpose and his algorithms have been used to process and invert various data acquired within Sweden and elsewhere. Because he usually supplies uncertainty estimates, it is possible for reviewers of his work to appreciate the resolution and uniqueness (or not) of his results. Early work by the Professors of Explosion Seismology and Electromagnetic Geophysics demonstrated the importance of basic sills in the composition

and structure of the upper crust. Results of this work have had an enormous influence on the interpretation of seismic reflection data recorded at many locations worldwide.

Research environment and infrastructure

The group has sufficient infrastructure for conducting top quality research. When facing a problem that requires new approaches, the Professor of Electromagnetic Geophysics enthusiastically designs and develops the necessary innovative equipment or algorithms.

Networks and collaborations

The Professor of Electromagnetic Geophysics is a member of a number of national and international networks. It collaborates with scientists within the Department, within Sweden and worldwide.

Opportunities for renewal and emerging science

The Professor of Electromagnetic Geophysics has proposed an ambitious programme involving the (i) development of an airborne controlled-source radiomagnetotelluric system and novel processing and inversion procedures for recently acquired airborne vector-magnetic and gravity data (only made possible as a result of fundamentally new technological developments) and (ii) applications of various airborne, surface and borehole geophysical techniques for characterising the hydrogeological properties of aquifers and aquitards. The evaluation panel recommends that the Electromagnetic Geophysics group work closely on the latter project with other relevant groups within the Department.

Actions for successful development

Since airborne geophysics plays a key role in investigations of the geology of the Fennoscandian Shield and elsewhere, the evaluation panel strongly recommends that the Department create an appropriate professorship in applied geophysics after the current Professor of Electromagnetic Geophysics retires in five to six years.

22. Panel 17

22.1 Department of Engineering Sciences

22.1.1 Executive summary

Assessment of quality

We found excellent or good science in a wide variety of fields, in most cases carried out by high level individuals. The following topics were identified as top quality or world leading research:

- magnetism research,
- electrochromic materials,
- low mechanical speed generators,
- nano-biomaterials,
- modeling of plasma deposition.
- accelerator based ion physics
- tribology research
- life-science oriented projects in Microsystems technology

We detected a number of “one-man shows”, i.e. scientific topics in highly competitive fields treated by a single researcher or a very small group, often not well integrated in the main activities of the division/department. These are:

- fusion plasma research,
- photonic bandgap materials,
- chemical nano-physics
- pulsed high power research,
- all electric car propulsion and wind power,
- solid mechanics.

Here, either a redirection of research with improved networking, a transfer to other departments /divisions, a substantial increase of funding in some cases or a discontinuation should be considered.

Opportunities for renewal

Generally we propose a focusing of research activities on the strengths existing in the divisions, i.e. mainly the outstanding topics listed above. Where possible, the future research should concentrate on areas which exploit (or have the potential to exploit) the synergies between the groups in the department and which utilize the excellent (and expensive) experimental infrastructure particularly of the MSL and the accelerator. More detailed suggestions

are given below. However, renewal may often be hampered by the present structure of the divisions and the model of faculty money redistribution.

We recommend that the critical mass of the most promising activities should be increased with the goal to achieve the level of “European Centre of Excellence”.

The relatively high age of some key researchers in solid state physics and solid mechanics suggests careful future planning and opens opportunities for renewal. The divisions of electron microscopy/nano engineering and nanotechnology/functional materials have been established fairly recently and should be given some time to take advantage of synergies in the department and to create their recognized scientific profile.

22.1.2 Assessment of the research activities of the individual divisions and specific suggestions for renewal

We limit our comments below on those activities in the Engineering department which have been presented to us during the week of the site-visit.

Solid state physics

Evaluation

Top quality/world leading:

- Research on spin glasses and magnetic materials. This is done very competently and has high potential for applications in the long run.
- Electrochromic optical materials. This activity constitutes a speciality of UU. Electrochromic layers are close to applications and have substantial future business potential.

General observations

The work on magnetic materials is in part basic research and scientific work of high quality. There could be more interaction between the Engineering and the Physics department. Spin glasses and magnetic nanoparticles have enormous potential for applications. This potential seems to be fully appreciated. Theoretical support is very good at UU, closer collaboration with MSL and ion physics could be fruitful. New opportunities are sought in magnetic semiconductors and spintronics. The work with magnetic particles is very promising. Many applications are possible but the listed ones seem more like ideas rather than concrete plans. More allocation of resources should be considered for the research on magnetic materials.

Work on optical, electrochromic materials is high class and relatively close to applications.

Suggestions for renewal

In view of the age profile of professors and researchers young talents should be recruited, preferably from outside Uppsala.

A more thorough way of future planning for recruitment (which is of course interrelated with the future research priorities) should be carried out. What is the next stage?

Many of the smaller research topics in the division (i.e. photonic bandgap materials, energy systems analysis, chemical nano-physics, diamond studies) are scientifically good with respect to the allocated resources. They appear, however, undercritical in view of the activities in these areas elsewhere in the world and should build stronger links to the existing strengths in the department, utilize the MSL facilities and collaborate with the Physics department.

General comments

The number of publications and PhD students appear appropriate. An increased cooperation with the Physics department should be sought to use the synergy at hand.

Solid state electronics

Evaluation

Top Quality, world leading:

- Modeling of plasma deposition processes

Internationally high standard:

- CIGS solar cells
- Microelectronic power devices
- Electro-acoustics, thin film passive components

Suggestions for renewal

Modeling of plasma deposition: Bold new approaches and applications are suggested to maintain the visibility of the group. Interaction of modeling with the various experimental thin film groups in Uppsala could be strengthened.

CIGS solar cells: The research so far has been of high quality and has produced top results, but the field should be evaluated carefully and consideration should be given to whether be continued in the proposed way. This appears rather as a company oriented product development with little prospects in new scientific achievements. There may be larger opportunities in reducing the costs and extending the lifetime than further increasing the efficiency. Research at UU should be concentrated on more challenging approaches.

Electro-acoustics in telecommunication devices is an extremely competitive field. It should be considered whether biosensor applications (using this technology) in close collaboration with microfluidics and life sciences would be a rewarding spearhead.

Si on SiC: Very promising work with high future potential. Transfer to industry should be safeguarded. Apparent synergies with the diamond project in the Electricity division seem to be at hand. A merger of all the diamond-related research activities in the department (also those in tribology and MST) has been proposed and is strongly supported by the panel.

Electricity and lightning research

Evaluation

Top quality, world leading:

- “Slow motion” electricity generators,
- Wave power generation

Internationally high standard:

- Lightning research

Internationally recognized:

- EMC research

General observations

This division is particularly strong in the design of innovative electrical generators. These skills are used in a variety of applications. They really utilize their strengths, because energy conversion is key here, and take a holistic system approach, go for large-scale demonstrations etc. and thus are in a leading position. This exists with other activities in the group that seem really sub-critical (eg. theoretical plasma physics (unconnected to ITER), wind power development etc.). The wind developments appear to be a purely independent attempt which, in view of other major activity in this field, is unlikely to play a leading role. We are doubtful that the all-electric car propulsion system including the flywheel development should go on totally independently as it has sub-critical size.

The panel feels strongly that there is a wish to pursue development and innovations quite far before engaging in collaborations with industrial partners. Obviously this approach has been successful in wave-energy developments (now there is the spin-off Seabased AB). However, wave power is very much in an early development phase, even R&D has not converged yet around certain solutions or approaches. The situation is totally different in wind energy, which is already an established industry with all the big manufacturers coming in, not to speak of electric vehicle propulsion with the automotive industry.

The division’s strategy / prioritization which is based on “utilisability” of various production forms is interesting, and the group should build further along those lines. The remark, that the group wants to work more on hydroelectric power generation, but cannot find funding, is surprising. For increasing efficiencies, e.g. at hydropower stations, it should be easy to acquire funding from industry.

Marine current power generation (shown to the panel in the laboratory) was also highly interesting. It would be worthwhile to explore the feasibility of this concept for larger scale power generation.

The division is led by a highly dynamic head with a remarkable record of awards.

The title of this division does not describe the strengths of the group. A new name could be considered.

Suggestions for renewal

For many practical aspects of prototype building like welding, fibre compounds moulding, coil winding etc. more external support/subcontracting should be sought for. This would liberate resources for more challenging work.

The generator work is quite diverse and should be focused to the most relevant themes, probably wave and marine energy conversion.

Networking should be increased for numerical simulations/FEM modeling to keep up on new modeling techniques.

Lightning/EMC/HV-testing: The balance between research and services should be checked. The practical relevance of lightning research in the long run seems questionable. It should be considered whether to shift the research activities in this field gradually to arcing problems in high-voltage equipment. EMC work appears good with high practical relevance, it could be strengthened.

The role of cold plasma research and “fusion” work in this division is unclear, sub-critical and without clear plans for the future. The same holds for the pulse power activity.

Diamond research: Why is this activity located in the Electricity division? A closer interaction/integration with solid state electronics, physics or MST should be considered. If the application is in the electricity division, more power electronic devices should be worked on. However, then the group would need to have a critical mass for future success.

Solid Mechanics

Evaluation

Internationally high standard

Renewal, general remarks

This is one of the “one-man show” singularities in research of the department. The chair, Bengt Lundberg, has doubtlessly a visible international reputation but will retire within one year and the two PhD students will finish soon. Research concentrates on “impact and waves” in mechanical systems with little (if any) overlap to other major research fields in the department, probably because of the emphasis on military applications. A tentative formulation about future direction was presented by the chair. The suggestion by B. Lundberg is to interact even more with other priority areas. With the retirement of the chair the panel recommends that this activity should be redirected towards research in areas where the department has a strong position.

Nanotechnology and functional materials

Evaluation

Between top-quality/world leading and international high standard. In particular the “Nano-Biomaterials” project has an outstanding level of scientific quality.

Recommendations for renewal, general remarks

This is a fashionable, quickly developing research area in an internationally highly competitive field. There is enormous potential for the future. Excellent and good scientific work is done with a remarkable output in terms of publications.

This is a fairly young activity in the department with a high potential and it should be given more time to fully develop. Some of the research topics (e.g. drug delivery or exploitation of algae cellulose) are application oriented and lend themselves to industrial cooperation or the formation of startup companies. This should be taken into account in the future.

Synergies with other groups in the department are partially used (magnetic beads, electron microscopy) but could be intensified, in particular in using the excellent MSL infrastructure. Whether to build “biology laboratories” at Ångström is questionable if suitably equipped laboratories from other departments are available on campus nearby. The name of the division is very general and non-descriptive for the work being done.

Electron microscopy and nano engineering

Evaluation

This is the most recent division in the department (~2y) and it seems too early for a fair ranking at this time. Several publications in renowned journals have appeared and the group should be given more time to develop full scientific excellence.

Suggestions for renewal, general remarks

This new activity has a high potential but must be given time to develop. Since this partly is a service activity for other groups, the balance between “service providing” and the group’s own scientific work is a delicate one and needs special attention, in particular when measuring scientific output. Synergies with the other groups are beginning to be exploited. A question raised was whether in the long run the development of new methods and techniques in electron microscopy can be achieved without closer cooperation with microscope manufacturers.

Also for this group its name is very general and only partially describing its activities. “Nano engineering” is too unspecific.

Ion Physics

Evaluation

- Accelerator based mass spectroscopy and related activities: top quality/world leading
- Ion implantation work: Internationally high standard.

General observations, renewal

The group has an excellent, modern set of state-of-art facilities for materials analysis and ion-surface treatments, the latter including ion implantation, ion beam synthesis and ion track formation. The group takes full advantage of their partially unique research infrastructure and their international reputation to produce high level research and demanding analytical services. The activities are interdisciplinary and serve priority areas of the society such as life sciences and environmental analytics.

The new application areas to studies of up-take of pharmaceutical products are very timely and build on established procedures for radio-nuclide dating. The group has identified future areas of development in sample preparation and handling procedures and in improving accuracy of data in this challenging and promising field.

Although the implantation and analysis systems provide a unique service with 50-50 percent internal-external use there seemed to be little interest in seeking external users from abroad, e.g. by running user's meetings and advertising the facility more widely.

The publications from the group are substantial and represent its broad activities. One of the far sighted visions is to form the "Uppsala academy of microdosing" together with biomedical departments.

Materials Science / Tribology

Evaluation

We rank the research of this group top quality/world leading. Sture Hogmark is well-known internationally in tribology. The group is well-represented at conferences in the field and has a good publication record

General observations

It is a highly active group providing important industrial service in terms of consultancy and background knowledge on the control of friction and wear on sliding surfaces. Interpretation of friction experiments requires a very high amount of professional experience. The use of higher resolution microscopy and better analysis techniques is bringing new understanding of the wear process.

Renewal

The future strategy has been well considered and includes the important role of providing well-trained PhD's for Swedish industry in this important area of engineering. In addition new coatings are being developed and evaluated including the so-called MAX alloys (with Lars Hultman in Linköping). These have high temperature stability and should pave the way to lubricant-free working systems. The succession of the soon retiring division head seems to be settled and the panel suggests to proceed in this direction.

Materials science and microsystems technology MST

Evaluation

A large variety of topics and applications is worked on in this division. Depending on the project, we rank the quality between top/world leading to internationally recognized. Outstanding examples are:

- Paraffin activated micropump
- Lab-on chip protein markers with bioluminescence,
- Integration of microfluidic platform for single molecule detection,
- Heparin coated microchannels with high wettability to analyse blood samples for HIV sensor.

General observations

The microsystems research is a very multi- and interdisciplinary division and makes full use of the strong infrastructure (i.e. the MSL lab). The division is actively cooperating with other academic and industrial partners.

It has a very good funding situation which allows for ambitious approaches and the junior faculty is making good use of this situation. The main projects on wireless networks, microfluidics and space microsystems are world class technology.

Ångstrom Space Technology Centre: Design, building and evaluation of a standard space test platform using microscience and technology. We saw high standard work (financed by ESA). A more intense cooperation also on the national level is encouraged.

Renewal (as also seen by group)

The following areas appear attractive:

- biomarker patterns for neurodegeneration
- ultra-sensitive and multiplexed analysis of proteins/peptides
- personalised medicine-related developments in the field of neurodegeneration
- strong focus on biological and medical aspects
- communications and networked sensors. This is a new field which expands collaboration into systems direction

The proposed activity "Micromachining of diamond by lithography of patterning layer" should only be carried out in an overcritical project combining

all the sub-critical diamond activities scattered all over the department. Apparently a corresponding proposal is underway and it is strongly supported by the panel.

22.1.3 General assessment and comments on the Engineering department

General

The Engineering department is the largest department within UU. Its external funding for research is clearly above average indicating adequate market orientation of research topics and high quality levels. The number of start-up companies having emerged from the department over the past years is outstanding and another evidence for many research topics being of relevance for society. However, transparency in assignments between companies and the university were not always very clear which might lead to conflicts of interests.

The panel feels that establishment of a faculty dedicated to engineering is in order. The Engineering department today is very large in terms of (external) funding, research staff as well as in the number of students. The specific character of engineering vis a vis science could be made explicit by splitting the two apart. This topic was discussed with the division and department heads and they too find the independent faculty an important future development.

The department has its strengths in research related to materials and in excellent experimental facilities combined with some high level individuals. The strategy for future research orientation has to be developed including a prioritisation of topics and showing the possible synergies between the divisions.

National and European collaborations are active but there is room for more, in particular in involving the unique experimental infrastructure.

The divisions often have quite non-descriptive names (in particular the two youngest ones) which may be an indication that the divisions are still developing or have changed over time. A future renaming seems appropriate which should make the group's focus and direction of research clearly visible.

The panel is convinced that the department of engineering is professionally and wisely led by Gunnar Holmgren and Jan Åke Schweitz. They take great care and a high level of foresight, safeguarding smooth operations and a successful future. Their hands are somewhat tied, however, because of faculty funding is limited and not very flexible.

Specific issues

In the course of the KoF07 site visit the panel identified some issues that hamper the department's efficiency in achieving excellence in research and education. The panel recommends a careful analysis by UU management and, wherever possible, appropriate action in these areas:

Financial issues

Overhead money should have a more specific return route, which would make overheads less obtrusive, especially for groups that pay more overheads than they receive research funds from the faculty. This should be rewarded in some kind by the university, e.g. by more faculty funds for basic research.

The system of distributing faculty funding is felt by professors to be very conservative and very disturbing because it is a zero sum game. No chances for organic growth is possible with faculty funding, endangering academic basic research.

There is a strong need for buffer money against fluctuations in external funding. This is in particular necessary in a department with such a high fraction of external funding.

Recruiting of future chairs

Bringing in new talent is sometimes problematic. Very few openings are available, and they have to be divided between strategic plans, diversification and renewal. Seed funding for new faculty should be on par with major European universities if international talent is to be recruited. There were, however, two good examples (Maria Strömme, Klaus Leifer) of recent recruitings and this process should be strengthened.

Retirement sometimes seems to be used as a savings instrument to improve division finances, and not as a tool for renewal.

“Mode I” knowledge production with academically driven values is used in faculty recruiting and assessment, but the faculty is motivating its research with “Mode II” thinking, involving industrial, societal, environmental and other external issues. In this review the external aspects and research carried out with external funding were highly emphasized. Swedish universities take care of many projects that would be carried out by national institutes in most other countries. This confuses the evaluation because many projects are non-academic in nature, and thus are difficult to judge on traditional academic criteria.

Chair plans

The faculty has worked on a (partially) new nomenclature and directions for the divisions in order to facilitate a renewal. Partly, these changes have been already decided. The proposed additional changes are:

- *Materials Science/MST* shall become “Microsystems Technology
- *Solid Mechanics* shall become “Engineering Mechanics”

For the latter we propose that this chair only should be established if sufficient faculty funding can be safeguarded in order to sustain a critical mass for high quality research in this field inside the department (see remarks in the assessment section). Otherwise we suggest that the resources should be used to reinforce one of the existing strong research areas.

General discussion with division heads

The panel asked for an (unscheduled) short plenary meeting with all the division heads (chair professors). Their main concerns match in most cases those of the panel (as described above) and can be summarized as follows:

- Most division heads (chair professors) expressed concerns about insufficient funding through the faculty, thus confirming the impression of the panel. Increasing it is on one hand considered necessary to safeguard continuity and on the other to pursue projects in basic research. Faculty money is related to size of the group rather than to the amount of external funding, but funding agencies expect institutes to match their funding, which is not happening. Many groups rely on 70% external funding.
- There is a need to bring in new staff to provide overlap before present aging staff leaves. The division heads were very keen on the idea to set up an own “faculty of technology” as also suggested by the panel (see above). They feel that so far “Technology” is at UU somewhat a step child.
- The present system forces applied research to displace fundamental research. If research staff had 30% of overheads back this would help.
- Funding is needed for junior faculty positions.
- In general Division leaders feel that they get excellent support from heads.

22.1.4 Research environment and infrastructure; microstructure laboratory

The Ångström laboratory provides a superb research environment, bringing together a multidisciplinary research community from different departments together in one modern building. An essential part of its research infrastructure is the Microstructure Lab (MSL), a 2000m² clean room facility housing microfabrication and analytical equipment such as electron microscopes. An evaluation of the MSL was done one year ago with a positive result.

Most current research activities described above depend on it as well as many of the opportunities for renewal. Networking with other academic clean rooms in Sweden is well established and should be continued and strengthened - as well as industrial interaction. This high-tech microfabrication facility appears well operated by a skillful management.

The rate of renewal of investments (which are often very expensive in this environment) appears unclear. The future needs of the nano- and bio-research programs in the MSL should be addressed.

The ion physics division operates a relatively new and well maintained accelerator mainly for materials analysis. This is a unique facility in Sweden and one of the very few comparable installations worldwide. This excellent facility enables outstanding research which the group takes full advantage of. In

addition they operate a high current ion implanter for materials research and implantation services to other public and private organizations.

The other laboratories visited by the panel appeared adequately equipped. The bio-nano research group needs biochemical and bioanalytical equipment which so far is used in other departments in other buildings which may not be very practical in the long run but a potential duplication in equipment should be strictly evaluated.

22.1.5 Other Observations and suggestions by the panel

Meeting with selected PhD students of the department

In brief discussions with some of the PhD students the panel got the impression that the students feel well treated and easily have access to their supervisors who have sufficient time for them. Their major concern was a lack of appropriate courses at UU which would prepare them well for their thesis work. Also, some concerns were expressed that supervisors did not sufficiently tell them which courses to take. Supervisors could teach more themselves. First publications should be made earlier (and not only towards the end of the thesis). The recent making public of open PhD student's positions has helped to reduce eventual problems with gender issues.

PhD level teaching issues

We find it curious that PhD students apparently have problems to find appropriate PhD-level courses in a research university. They have to shop around for suitable courses, and often do not find any. To ease the choice of the courses a better tutoring of beginning PhD students on the appropriate curriculum or a broader range of courses could be offered. This could include clearer suggestions for curricula as also tutoring support. Going to KTH for courses is welcome cross-fertilization but also may be an indication of inadequate post-graduate teaching. We find the financial incentives to work against creating PhD courses. A teaching grant specifically for PhD courses would be required to promote PhD level teaching.

Other issues as food for thought

Research strategy group at the Engineering department is an informal body that seems have considerable power with faculty money distribution. No clear explanation was offered on its working principles, and ways of selecting its members.

What is the basic unit of research? Chairs seem to think that it is Chairs, but junior faculty are running their units very independently. Department is an instrument for dividing money and not really setting strategy (due to lack of resources, not for lack of will).

Why is Uppsala University keeping up its own publications database? Is it consistent with international measures? There are many commercially avail-

able databases run by information companies. Can the database produce information which is not available from commercial sources, like joint publications with external groups be singled out? This would be a good measure for “connectedness”.

23. Panel 18

23.1 Department of Information Technology

23.1.1 Executive Summary

- Information technology has had, and will have, profound influence on our lives. Further investment in this direction is needed and is appropriate by standards of intellectual merit as well as societal importance.
- Most subdisciplines of Computer Science (which does not include all of Information Technology) evaluate the quality of research by impact, very broadly defined. Measuring only journal publications, or citations of journal publications, offers a deceptive view of the strength of work in these areas, unless you also consider such impactful activities as books and conference publications, scientific awards, providing software for download, participation in international standards bodies, and others.
- The highly distributed funding model used at UU results in suboptimal performance. Faculty are obsessed with the effects of their activities and of any possible change within the institution on their financial position.
- The Linnaeus Center for Biotechnology represents an important part of the future for both Computer Science and for Biology. It needs to be nurtured in a number of ways.
- Most activities within the Department of Information Technology are at least world recognized, and several are world-class or even leaders of the world.
- On the other hand, the activities within the Department of Information Science that we reviewed are very weak. We recommend transferring the small activity in Human-Computer Interaction to the Information Technology Department, and discontinuation or profound reorientation of the activity in the group called “Computer Science.”

23.1.2 The Big Picture

Information Technology is extremely important for society, and IT is a main component in most industrial production as well as in products and services. IT has, in recent years, given us the cell phone, the personal computer, the Internet and World-Wide Web, electronic commerce, many

improvements in Medicine, and a host of other profound changes to our lives. There is good reason to believe that these world-changing innovations will continue to occur in the foreseeable future. A central message of Thomas Friedman's *The World is Flat* is that a nation's prosperity in this century depends primarily on the number of excellent information-technology practitioners it can educate and/or attract.

Yet IT is still a new and expanding area for research and education and needs extra consideration. There is evidence that, possibly for historical reasons, Uppsala's funding for IT activities is significantly below average for the university, regardless of whether one calculates per faculty member, per student, or per course. It is surely lower than it should be, given the societal importance of the subject. While there are certainly many subtleties regarding what constitutes "fair" funding:

- The evaluation team recommends that the level of university support for Information Technology be examined carefully, and that any shortfall relative to the university average be redressed immediately.

23.1.3 Evaluation of Computer Science Research

Much of the research activity evaluated by this panel concerns computer science. The research community in many of the subfields of Computer Science has a way of evaluating research quality that differs from the academic norm. When comparing the research activity of the computer scientists of Uppsala University with that of similar groups internationally, it is important that one take account of these specific criteria.

As in all other disciplines, it is the impact of a research activity that matters most, rather than the number of publications. Impact is measured by a number of indicators such as awards and scientific prizes, invitations as keynote lecturer, peer recognition, patents, startup companies, transfer of scientific results to industry, and citations of books and journal publications. However, while in most other disciplines journal publications are considered to be the central method of communicating one's results (and hence journal citations the key quality criterion), in many subfields of computer science, conferences are the prime outlet for publications. The acceptance rate at the top conferences in computer science is often 10-15%, which is much lower than that of even the most competitive CS journals. The production of software, and more importantly its adoption by the computer science community or industry, is another quality criterion that distinguishes the computer science field from many others.

We observed that the CS researchers at Uppsala generally do well by publication count; Uppsala has far more than its share of the highest cited CS researchers in Sweden. On the other hand, while the faculty took pains to point out these statistics, they neglected to remind the panel that Skype was developed by one of their graduates, based on concepts they learned during

their MSc studies. We are concerned that when only journal publications are used to evaluate faculty research, one not only gets the wrong picture of Computer Science research, but faculty are prompted to work along lines that may be less productive than they could be.

23.1.4 Funding

The question of what is paid for, how much, and by whom is central to the operation of any academic enterprise. The panel believes there are arguments for reconsideration of how information technology is supported. Below, we give the picture as we saw it, and make our arguments for modifications.

Funding in the Department of Information Technology

The funding for the Department of Information Technology is divided according to three activities; undergraduate education (39%), faculty research (22%), and externally funded research projects (39%). The university provides the first two components of this funding. The department has a good acceptance rate for its research proposals submitted to the national resource councils. The division of Computer Systems (DoCS) and the division of Computing Science (CSD) have together 27% of the total grants of VR (the Swedish Research Council) allocated for CS. EU-funded research, however, is only 3% of the total departmental budget.

We were pleased to learn that the department has a goal of supporting some research time for every young faculty member. We believe it is extremely important that young PhD's be able to conduct a research program and, if they are good enough, develop research funding of their own. A related problem is that it is far more difficult than it should be to finance a PhD student. Because PhD work is considered long-term employment, while research grants are generally for a shorter time, it is impossible to "hire" a PhD student without some guaranteed backup financing. That backup can only come from the department. However, the ability of the department to implement this important objective is dependent on several structural changes, in addition to a rectification of the possible underfunding problem mentioned above.

- The department should pool its faculty funding for education and research. This will make it easier to lighten the teaching load for the young faculty and to leave them more time for research. They should develop a department-wide funding system for PhD students, aiming at doubling their number.
- The department awards a significant number of MS degrees. Today most of the master students do their thesis work in industry, and the involvement of faculty in the MS-level research can form a link between the company and university research. It is not unknown for industry to be asked to make contributions to the academic research program in exchange for their own employees' participation therein.

Funding in the Department of Information Science

We examined two groups in the IS Department: Computer Science and Human-Computer Interaction. In neither group was there an adequate level of external funding. Several senior-level positions that were planned have remained both unfilled and unfunded. We do not believe that funding is the essential issue for these activities, and the reader is invited to our remarks under the headings “Computer Science” and “Human-Computer Interaction.”

General Comments

The university has a decentralized economy model. Funding of teaching and research according to the details in this model dominate the organization, and it seems to hinder activities and initiatives, from the department level to the individuals.

In its discussions with several faculty members, the panel has observed that the completely decentralized funding system applied by Uppsala University has a large number of adverse effects. Perhaps the most visible of these is the obsessive preoccupation of most faculty members with the effect of any of their decisions on their budget and the sometimes perverse or conservative strategies that they develop to keep the budget they presently have. One example is the income from teaching; in discussing possible reorganizations or mergers, we have often heard that by moving to another department or faculty, a division would lose its course portfolio (and the ensuing income) because the department they leave would recreate a new course rather than buying the service from outside. For several members of the panel, the completely decentralized budgeting system used at Uppsala University appears to be a significant impediment to change.

23.1.5 Organization

The internal organization of the departments visited, their composition and their position within the two faculties concerned are results from fairly recent administrative reforms. The panel has however come to the conclusion that some of these issues should be reconsidered. The composition of the departments visited seems rather arbitrary. For example, we see no particular reason why the STS center should be located at the IT department. Nor do we fully understand why there are two separate groups of systems, control and signal processing within the faculty of Science and Technology. More serious, however, is the situation of the Department of Information Science within the Faculty of Social Sciences. Our observations and recommendations concerning this are given when we address computer-science research in general. It is obvious to the panel that the border between the various faculties/scientific domains has become an efficient obstacle against cooperation. The university must find mechanisms for transfaculty cooperation, facilitate and encourage departments to take advantage of teaching resources from other departments

at other faculties. It should furthermore encourage and facilitate the creation and running of multi- and cross-disciplinary centers common to more than one faculty. The STS center could be one such center, a center for Human-Computer Interaction another one.

The friendly atmosphere and the cohesiveness that prevails at the Information Technology Department have been mentioned by several members. The panel believes that such friendly atmosphere is indeed a valuable and rather unique asset that undoubtedly contributes to the quality of the work performed at the department.

However, the desire to maintain such atmosphere and to avoid any potential for disagreements or tensions appears to prevail over the need to formulate a common vision and a collective strategy for the department. In response to our questions, several members have repeatedly stated that the department was still very young as an administrative entity, that more time was required to absorb the fusion of the different divisions that has taken place when the department was set up, that the formulation of a collective mission statement was the object of many internal discussions, but that no collective objectives had been formulated so far. The panel wonders whether the prevailing friendliness prevents them from expressing diverging opinions and from stepping on somebody's toes even when necessary.

It appears to the panel that the funding mechanisms dominate the organization of the department and that they are an obstacle to the removal of barriers between divisions. This structure of divisions, which do not appear to the outside eye to be justified on scientific grounds, may well be a comfortable way of avoiding potential tensions. But we believe that the setting up of a collaborative leadership and of a more collective management of the resources across the divisions would constitute a plus for the department.

The panel believes that, given the quality of its members and of the research produced by them, the department is depriving itself of opportunities by not setting itself some ambitious objectives as a collective entity. Given the large size of the department and the broad scope of its activities, we are not suggesting that this should take the form of one common research programme. However, we believe that the absence of a common set of research strategies and of the formulation of a mission statement for the department is an impediment to greatness. We also believe that such formulation can take place in a collaborative leadership that preserves the friendly atmosphere that is a trademark of this department.

Specific Proposals for Reorganization

There are a number of more detailed proposals we would like to see. These are discussed in sections devoted to each of the affected areas, but we summarize them here:

- There are similar activities in the signal processing and systems areas in the Departments of Engineering Science and Information Technol-

ogy. A merger of these activities, at the appropriate time, should be considered.

- An appropriate long-term place for the Linnaeus Center for Bioinformatics needs to be found.
- A merger of the Human-Computer Interaction activities within the Department of Information Technology and the Department of Information Science is recommended strongly.
- There are many Computer Science activities in the Department of Information Technology, and a smaller number of CS activities in the Department of Information Science. Although they each cover areas squarely in the computer science area, they are of radically different quality. A resolution of this anomaly is essential.

23.1.6 Recommendations for Renewal

In this section, the panel will outline and justify its recommendations that may lead to a renewal or re-orientation of the research portfolio of the units that fall in its realm. During the interviews, the panel members routinely queried the department or division representatives about the directions they would suggest or take, given the opportunity. To the surprise of the panel, the answers in most cases indicated that the interviewees seemed to be quite satisfied with their current portfolio. The panel concludes that the IT department lacks a coherent institutional strategy for research on the medium term, i.e. about five years into the future. Not surprisingly, however, the panel frequently heard a call for more base funding for research.

The specific recommendations for renewal are the following:

1. The IT department should be asked to develop a research strategy with a medium-term horizon, which means 5 to 8 years from now. This strategy should be agreed between the department and the faculty in a transparent process.
2. In various divisions, a number of senior faculty will retire within the next few years. The panel recommends that retirements should be anticipated well ahead of the time of retirement, such that a successor in the same or different research area (according to the department's strategy) may be able to take office even before the retirement of his colleague. This would assure that enough time will be available to search for a person fulfilling the quality requirements given. Moreover, it would assure a smooth transition, both in education and research.
3. As outlined in the assessments of the various divisions and research groups, the panel was generally impressed by the quality of the research done in the IT department. However, it felt that additional depth could be added with competencies in the following areas:

- *Embedded systems* - to complement the strong group on modeling and verification, which could extend and apply its research correspondingly; moreover, this area is of prime importance in WISENET.
 - *Databases* - in the broad sense of the term, including study of the Web, digital libraries, and a host of other large-scale data problems.
 - *Architecture* - as the group is small and risks to suffer from subcritical mass, even though the impact it currently has is significant.
 - *Algorithmic bio-informatics* - developing new algorithms that can better cope with the complexity of problems present in bio-informatics (beyond massively parallel processing or numerical algorithms).
 - *Biomedical engineering* - this area would be a good addition to the research portfolio of the Division of Systems and Control, and could leverage on the excellent competencies in signal processing and system identification.
4. The IT department shows an impressive strength in the areas of model checking, algorithmic program verification, testing and model generation. These areas have enough critical mass to achieve impact, and need not grow in size. The same applies for the area of Human-Computer Interaction, provided that the concentration of all HCI researchers as suggested in the section on HCI is implemented.
 5. If the opportunity arises, the department may consider extending its research portfolio in the areas of software engineering, artificial intelligence, statistical methods and randomized algorithms. The former two would form new areas that would fit perfectly with the department's strength in formal methods, adding the capability to use such methods in complex software systems, while the latter two areas would round off the capabilities present in the divisions of Computing Science and Systems and Control. In any case, the recommendation is to go for the best talent that may be available.

23.1.7 Interdisciplinary Centers

The panel was asked to evaluate interdisciplinary centers that are affiliated to the Information Technology Department. The presentations and the material given to the panel indicated however, that only three of the five centers (STS, CeTUSS and WISENET) are actually involved in research activities. The mission of the other centers (UPPMAX and NITA) is to provide services for research or to establish links between researchers and the broader public. Nevertheless, the panel decided to briefly comment on all centers that were presented.

UPPMAX

The center provides high performance computing (HPC) services to the Swedish research community. The offerings currently consist of a range of computing clusters, the most recent being a cluster of AMD 2200 cores. HPC services are essential for a research community that more and more relies on computational models and simulation. UPPMAX therefore may develop into an indispensable infrastructure for research, avoiding expenditures for significant local computing power by the various research groups. Success depends, however, on there being mechanisms in place for sustaining the quantity and quality of the services offered by UPPMAX. This, in turn, calls for a competitive admission scheme for research projects intending to use the center's resources. Such a scheme does not seem to be in place at this time, perhaps because the center is still in its build-up phase, and its resources are not yet fully booked. On the medium term, the center may consider to charge the projects for its services, to be able to sustain its services at a top quality and adapt them to user demand. It seems self-evident that research projects using the center should budget (and be allowed to spend) the cost of their necessary computing.

NITA

The mission of the Swedish National IT User Center is to provide a forum for the discussion about new developments in and the use of information technology. Considering the important role IT has in our lives, NITA may play an important role as a two-way information channel between R&D in information technology and the broad public (including politics).

The panel feels that NITA needs to clearly define its role. In the view of the panel, NITA may:

1. Focus on the main role it currently has, i.e. the channel between R&D in information technology and the broad public - this is the panel's recommendation;
2. Develop into a think-tank initiating public debates and developing policies connected to the use of IT. However, in the current funding situation this would stretch even more the resources available. The panel therefore recommends that this option should only be considered if additional funds are made available and staff with the appropriate profiles can be hired.
3. Become a true research unit in the area of usability of IT-based systems. Considering that there are already two research divisions dealing with HCI the panel does not favor this option.

STS

The mission of STS is (a) to increase the interaction in the science-technology-society field, (b) perform multidisciplinary research in this field and (c) engage in multidisciplinary educational issues. The research of STS focuses on the in-

interfaces between science, technology, and society. The center's main research activity concerns the critical examination of the relationship between university and scientific policy on the one hand, and economic use of knowledge on the other hand. The center also contributes a syllabus in the Systems in Technology and Society Master Programme offered by the School of Engineering. According to the center's web page, there are currently five on-going research projects. The panel was not given enough information about the results of these projects to be able to assess their quality; moreover, the center's activities are very much outside the mainstream of competence of our panel.

While the panel recognizes the relevance of the mission and research activities of STS, it felt that the shape the center presents to the spectator is blurred. The center's representatives need to invest some effort in better presenting and "selling" its mission and its approaches to an audience whose background is in science and engineering. The panel also notes that the center's work is only loosely coupled with information technology; therefore the question arises why the center is affiliated to the IT department.

CeTUSS

The mission of CeTUSS, "to enhance the development of engineering education [...]", is an important one in an area in which traditional forms of teaching prevail to a considerable extent. The approach of CeTUSS towards implementing its mission is to organize workshops and conferences in engineering education, and to create a network of international collaborations. In addition, research results are published in refereed publications.

The specific objectives of CeTUSS as a National center consist in bringing innovation to Swedish engineering education and in staff/teacher development towards good didactics and pedagogy in engineering education, among others. It is not obvious, however, that these objectives can be achieved (a) with the approach taken and (b) the limited resources of the center.

The panel suggests that the work at the center should be better focused to achieve the goals mentioned above. This could be achieved with an approach that has as a clear goal to have an impact on the teaching and learning in the different Swedish faculties of Engineering Sciences. The center should also plan for the evaluation necessary to assess whether the improvement in learning quality has been reached or not. Establishing a center that will be able to compete with other world-class institutions in research in engineering education requires a certain critical mass. The IT department should consciously decide whether the necessary investment can be made.

WISENET

WISENET is a Vinnova Center of Excellence that was awarded to a consortium consisting of three research groups at UU (Computer Networks, Signals and Systems, and Ångström Laboratory). The mission of the center is to produce research in the area of Wireless Sensor Networks (WSN), specif-

ically addressing energy efficiency, security, fault tolerance and robustness. All these qualities are needed in WSN to achieve a long lifetime of a sensor network during which it fulfills its task without maintenance. The WISENET consortium leverages on competencies in sensors and microsystems, networking, and wireless communications. Interest in its future research results is expressed by a substantial number of Swedish companies. The panel commends the consortium for its success in receiving the prestigious grant. However, it is concerned by the fact that WSN research started a decade ago, and many researchers world-wide are in this field. It therefore recommends to clearly identify the center's unique selling proposition. A unique strength of WISENET may lie in the competencies of the Ångström Laboratory, with its sensing technology and micro-optics, fibre sensors, micro-systems, material processing, device fabrication, packaging and measurement technology. Combining this with strong capabilities in networking and wireless communication, WISENET may indeed make a difference.

However, the panel was surprised to learn that the world-leading researchers in wireless communication within the systems and control group of the IT Department are not involved in WISENET.

23.1.8 Evaluation of Research Programs

We continue with a review of each of the research programs that the panel was able to hear.

Computer Systems

In this section we consider the group called “Computer Systems” within the Department of Information Technology.

Verification

The work done on Verification, mostly based on Model Checking, is of world-class quality. Important theoretical results on improving this technology by state-space reduction and on SAT-based approaches have been achieved. The systems implemented, UPPAAL and TIMES, are among the top systems in their class worldwide. The number of downloads of these systems, indicating their use and their usefulness, is very impressive. The model-based approaches follow a dominating and successful trend in embedded-system design. The past and the foreseen applications, verification of concurrent, distributed, and real-time systems, are highly relevant.

The work on verification could even be strengthened by extending it in several directions. Firstly, by combining the model-checking technology with other relevant methods such as deduction, abstract interpretation, constraint solving, and linear programming; second, by bridging the gap to the Systems and Control division by establishing an additional chair for the Design of Embedded Real-Time Systems. In this combination, the work on Hybrid Systems

would be promising. Stretching the work in the direction of embedded systems would also profit from an extension of the department's Computer Architecture group, which currently does not have the necessary critical mass.

Computer Architecture

This is a small group led by Erik Hagersten, focusing on multiprocessor architecture and cache design. This group had made international impact by publishing at the premier conferences such as HPCA and producing innovative research in cache behaviour prediction.

The work on Stat Cache is world leading and has led to a startup company that is producing a highly useful program analysis tool. This startup, however, also has the effect of reducing by half the amount of academic time in this area.

Internationally, successful computer architecture groups require large numbers of PhDs, postdocs and junior academics due to the experimental nature of the subject. The current size of the Uppsala group is too small and needs increase in size for long term sustainability. Apart from recruiting more staff by external or faculty funding, there may be synergy with the programming language group which also examines parallelism although it is currently within a separate division.

Computer Networks

This active group is rightly proud of its ability to empirically challenge many of the assumptions made in modelling of mobile networks and to develop tools that are internationally used. Unlike some of the groups within the department, they have been able to extract significant external funding for the WISENET center, which, although in its early days, has the potential to be highly successful.

Wireless networks is a highly crowded field, and there was little evidence of high level international impact here. Since the Systems and Control group is strong in theoretical research in wireless communication, this would be an obvious place for collaboration, offering the potential of strengthening the Computer Networks group. Finally, given the relationship between networks and processors within parallel architecture, this may be an area for further collaboration.

Human-Computer Interaction

In this section we address work under the "HCI" title in several different units of the university.

Overview

Human-Computer Interaction (HCI) is a broad, multidisciplinary research area. This is evidenced by a large researcher community that, for instance, ranks among the three biggest special interest groups of ACM. It has become

an important element of software engineering. Large software houses and telecom companies list usability and user experience among their core competence areas. In Uppsala University, research activity in HCI is spread over three divisions. In the Department of Information Technology, the Division of Human-Computer Interaction has 2 (promoted) professors and 3 researchers. Another Division of Human-Computer Interaction exists in the Department of Information Science, with a small staff. In addition, one lecturer in the Division of Computer Science at the Department of Information Science also does teaching and research mainly in the HCI field.

Research Efforts

Among the three units where HCI research gets done, the HCI division at the IT department is clearly the most active, both in absolute numbers and in relation to the size of the personnel. The division has done long-term research on the requirements, usability and design of work-related IT systems, such as those used by tax officials, train traffic controllers, and train drivers. Another theme is the development and study of methods for user-centered systems design. The research is of good level, and some of it is unique: it is rare to be able to collect such long-term experiences on the organisational and work environment effects of IT systems. The research is done in close co-operation with a number of companies and organisations. It would have a higher impact on the HCI research community if the findings of the long-term research were reported and synthesized beyond case-study level. The networking activities of the HCI researchers are outstanding. Launching conference series and representing the Scandinavian HCI research on many international bodies has made the researchers known to all in the Scandinavian HCI research community, and increasingly also internationally. The research in the IS department tackles some niche areas (information visualization, human-robot interaction) in addition to some themes that are shared by the IT department.

Opportunities for Renewal

It is clear that the HCI research (and education) is spread far too broadly. All the units are small and none of them achieves a critical mass, which is particularly important for an inherently multidisciplinary field. The panel recommends that the HCI activity is moved into one division.

Internationally, HCI has in some cases formed a department or program of its own, but predominantly it can be found in CS departments. Also in the case of Uppsala, establishing a department or division that is shared between the two faculties would be a viable option, if it is administratively possible. If not, the natural home for the joint division would be the IT department, also because the bulk of the HCI activity is there already. The people in the different units have a good track record of co-operation, so no major problems caused by such a move are to be anticipated. The experimental HCI research

of the IS department would complement well the current research at the IT department, where such tradition (which is central to HCI) is lacking.

Such a merger would create a unit that is large and active enough to deserve a chaired professor. Such a position currently exists in the IS department but it is unfilled because of lack of funding from the faculty. When considering new avenues for research, the division should be careful to choose topics where there is a good chance to gain a leading role. Mobile HCI, a theme suggested to the panel, is certainly important, but as a research field it is already very well populated.

Suggested Actions

- The HCI people in the different units should be placed in the same division.
- Provided that this is done, the division should get a chaired professor.
- More effort should be put to disseminating the results gained in long-term studies to the HCI research community.

Systems, Control, and Signal Processing

There are two different groups at Uppsala whose activity covers systems, control and signal processing: the Division of Systems and Control, within the Department of Information Technology, and the Signals and Systems Group within the Department of Engineering Sciences. Like in several other similar situations, the existence of two different groups with significantly overlapping activities finds its roots in a sequence of “historical” decisions. As it happens, the balance of the research activities in both groups is heavily tilted towards activities in signal processing, with a lesser emphasis on control.

Systems and Control

The Division of Systems and Control, in the Department of Information technology, even though small compared to similar divisions in other Swedish universities, performs world leading research in system identification and in signal processing. The research activities cover both theoretical research of the highest international quality and a range of applications in which the theoretical results produced by the members of the division are able to achieve significant improvements over existing technologies. The range of applications that were presented to the panel included problems as diverse as land mine detection, breast cancer detection, wastewater treatment, vibration attenuation.

The division publishes in the top international journals, and its leading members have received a range of prestigious scientific awards. At the same time, the division maintains a healthy range of partnerships with industrial companies.

One of the specific features of this division is its rather unhealthy age distribution. Three of its six professors, including its two star researchers, Torsten

Söderström and Petre Stoica, are beyond age 57. The panel strongly recommends that the departure of Professor Söderström should be anticipated by the recruitment of a new chair of high calibre within the broad area of systems, control and signal processing. It is always easier to attract such high level person to a group that has a very high profile.

Signals and Systems

The Signals and Systems Division, within the Department of Engineering Sciences, was created some ten years ago with the objective of strengthening the research activities of a group in electronic circuits in that Department. The present head of the division, Anders Ahlen, is a former member of the Division of Systems and Control. The research activities of the Signal and Systems Division, which are of an internationally recognized nature, typically arise from real applications problems. They cover signal processing, wireless communication and sensor networks, signal processing in medicine, and non-destructive evaluation of materials by ultrasonic techniques. The group has many industrial contracts, as well as some international collaboration in European networks. They also participate in the VINNOVA center of excellence WISENET. Three spinoff companies have been created by members of the group.

The signals and systems division of the Department of Engineering Science is composed of 4 promoted professors and 8 lecturers. The members are heavily involved in teaching activities. One complaint that was expressed is the difficulty of funding PhD students when most of the resources come from industrial contracts that are typically shorter than the 4 or 5 years required for a PhD.

Recommendation

The evaluation panel believes that it would make a lot of sense to merge the presently separate divisions of “Systems and Control” and of “Signals and Systems”. Besides the fact that there is a significant overlap in research activities and research methods between the two groups, this would probably allow for a better balance between the funding sources; in particular it might enable the bigger group to pool some of its resources together to provide for longer range funding for PhD students. A good opportunity for such merger could be at the time of hiring a new chair, in conjunction with the future retirement of Torsten Söderström.

Computer Science

Under the heading of “Computer Science” we place the work under that title in the Department of Information Science and the division called “Computing Science” in the Department of Information Technology. The four research groups in Computing Science are all internationally recognized, and in some cases world class. The work in the group called Computer Science is consid-

erably weaker, and we shall discuss it at the end. The following four sections refer to research within Computing Science.

Programming Languages

This group is best known for its work in compilation for the concurrent functional language Erlang. They have used model-checking to find bugs in extremely large Erlang programs. Unlike some work in the area, their output has been taken up and used in industry. Recently, there has been significant world-class work in developing highly effective memory-management techniques making a contribution in this highly competitive area. Like in many groups in IT, the number of members is very small. Pooling of resources with program verification and computer architecture around the area of embedded systems may help raise the international presence of the respective groups.

Database Systems

The database activity within the IT Department is internationally recognized for work in several modern directions: databases for the “semantic Web” and for stream systems. Their work has had significant impact, appearing in releases of database management systems of IBM and MySQL.

Constraint Programming

There are many groups in the world working in this area, and it is very competitive. The group within the IT Department has developed a number of applications using the technology and produces a good number of MS theses. As a kind of optimization, constraint programming solutions should be compared with the results of using any of several other viable approaches to any given problem. Unfortunately, the panel was not able to determine how competitive the solutions were.

Algorithms and Ecommerce

We were told of interesting recent results on the efficiency of searching in the model where the length of keys is bounded. Possibly of more pragmatic interest are the results on combinatorial auctions, where the advantage (to the seller) of offering packages of items was demonstrated for the case where the size of the problem is large. A related company in the area of advising on auctions has been formed to exploit knowledge developed in this research program. The work, while in its beginning stages, is world recognized.

Computer Science within Information Science

There is little external funding, and few PhD students. Interaction with other groups is minimal. The computer scientists on the panel unanimously agree that the research work is significantly below the standard of even mediocre Computer Science. We believe that the faculty in this group are unaware of the standards of the field in such matters as the need to demonstrate the

value of one's ideas (rather than simply stating them in a paper). They seem uninformed of some key ideas in the fields in which they are conducting research. Likewise, the standard of Computer Science instruction seems very weak. They appear to have the notion that you can train someone who is able to supervise programmers, without giving them the ability to be strong programmers themselves. Although there might be an occasional counterexample, we believe that the vast majority of supervisors in software engineering or software architects are themselves programmers with a high level of experience. A third concern is that Computer Science now finds itself in a department with four research groups that do not interact. The whole department seems to have very little financial support from above and little opportunity to improve itself.

The panel discussed intently how the situation can best be rectified. Our conclusion is that the research-quality issue is so severe that it is a mistake to invest further in this activity or to expand its role. In particular, we do not recommend that the group be allowed to offer a master's degree or admit additional PhD students, until a way is found to improve the standing of the group in research. Neither do we recommend filling open positions in the group, unless the appointment will go a long way toward solving the problem. We discussed the possibility of merging this group with the Computing Science group within IT. Our conclusion is that such a merger should only be undertaken if Computing Science or the Information Technology Department as a whole is willing to assume responsibility. It was not our mission to evaluate teaching in any department, so we cannot judge if the Computer-Science people offer excellence in instruction. However, we did have the opportunity to hear from a sample of students what their courses covered, and we have concerns along this line. Thus, even if the IT Department were willing to take the Computer Science faculty into their group, it is unclear whether the IS group could fulfill the teaching mission for the subject.

We also discussed the possibility of a name change. It was explained to us that the name of the group within Information Science, in Swedish, is very different from "Computer Science," so it is unclear why that name was adopted in English. As it stands, a search on the terms "Computer Science" and "Uppsala" has hits for people in this group, so in a sense they represent Computer Science at Uppsala to the world, or at least to the English-speaking portion thereof. We do not think this is a good situation for the university to be in. We believe that the intent of the group is to serve the needs of what amounts to a business school for instruction in databases and some other computer-technology subjects that business students might need to know a little about. In that sense, they are positioned similarly to activities in a few business schools such as MIT's Sloan School or NYU's Stearn School. However, at both these schools, "Computer Science" is not the term used for the software group. "Business Informatics" might be a more appropriate term. Changing the name does not solve the problem that the research

is not competitive. However, by removing the inappropriate label “Computer Science,” the university will look better to the outside, and can solve the problem at a more leisurely pace.

The Linnaeus Center for Bioinformatics (LCB)

Overview

Bioinformatics is a central activity in modern Biology, and provides many fascinating challenges for Computer Science, Statistics, System Theory and Mathematics. The main challenges in organizing research in Bioinformatics arise from the multidisciplinary nature of the area: Bioinformatics needs expertise from all these disciplines, and it is not obvious what the optimal organization would be.

One part of the activities in Bioinformatics in Uppsala is in a dedicated center, the Linnaeus Center for Bioinformatics (LCB). It started in 2002 and has 3-4 professors and a staff of about 25-30. Currently, LCB is looking for two new faculty members. The LCB was also evaluated by the Biology panel (Panel 15).

Research Efforts

The main research activity in LCB is in genetics and genomics. There are also several activities with mostly service functions (data warehousing for microarray data, high-performance computing). The data-warehousing activity for gene-expression data constructs a platform for storing and analyzing large-scale data sets from expression experiments. The activity seems interesting. At the same time it would have been useful to know more about the relationship of this effort to other similar efforts. LCB is also involved in high-performance computing, but mainly in a supporting role.

There are four research groups in LCB. The group of prokaryotic computational genomics looks at the machinery for decoding protein-coding genes, which can be viewed as an information-transmission task. The emphasis of the group on eukaryotic computational genomics is on mammalian promoters and applications for farm animals. The group on machine learning and computational biology has several themes; among others, it uses different data sources to look at processes involved in gene expression. The group on genetics tries to understand the mechanisms behind complex traits, using different computational and biological methods to look for different models of inheritance.

The research in LCB is of good international standard. The two groups in comparative genomics and computational genomics, as well as the group in machine learning and bioinformatics, have a good track record in research, and they have good connections both nationally and internationally. The group on genetics and QTL mapping is especially strong and has been received very well: it represents a successful modern approach to finding complex genetic effects. Overall, the research in the LCB is world class.

Opportunities for Renewal

The person in charge of the genetics group in LCB is apparently leaving Uppsala University to go to SLU. While LCB is a joint center between UU and SLU, there seemed to be some uncertainty regarding whether he can continue to be involved in some way in the operation of the center. It seems that the boundary between the two universities should not cause problems such as this. The continued participation of this person in the LCB would be very important for the center and for the university.

The computer-science aspects of LCB's research are concentrated on the high-performance computing. The algorithmic research in bioinformatics is not very visible in LCB. This type of an approach is very active in the international bioinformatics community, and one might consider that this theme could be a useful addition to LCB, in cooperation with the Department of Information Technology. The "Signals and Systems" division in the department of Engineering Sciences is partly doing things similar to those at LCB, but apparently the collaboration is not very strong.

Uppsala provides a wealth of biological research as well as a good selection of work in relevant fields of Computer Science. As a young organization in the intersection of many disciplines, the LCB faces the challenge of finding a suitable role and modes of collaboration. The center seems to have made a promising start in establishing novel research themes and in collaborating with different groups inside and outside the University. The future development of the center requires adequate commitment from the university and a decision on the type of the unit that is desired.

Bioinformatics as a Showcase

The panel considers Bioinformatics as an interesting showcase. It offered and still offers several challenges that Uppsala University should adequately cope with.

1. It can demonstrate how UU deals with the development of a promising new field.
Traditional universities often consider new developments to be of transitional nature. Computer Science is a particularly good example for this. Excellent judgment is needed to distinguish between a promising new field and the next short-lived hype. The panel believes that Bioinformatics is a serious field with a strong perspective.
2. It needs a special organizational structure due to its cross-disciplinary nature. Biology, Computer Science, Mathematics, Statistics and System Theory have to cooperate on the foundational level, Medicine and Pharmacy have to be included as application areas to be successful. Continuous communication across the fields needs to be maintained.
3. This organizational structure needs a strong advisory committee because it is outside of the Faculty/Department structure.

4. It has shown that UU was not able to react to the threat of losing a brilliant young scientist essential for the success of the center.

Suggested Actions

- The LCB should aim for a close alignment of the Bioinformatics activity, the local Biomedical needs, and the computational methods developed in Computer Science and Statistics. One way of achieving this would be to have a board for the LCB containing representatives from all these departments.
- In filling the vacant positions, the LCB should consider the role of algorithmic research in Bioinformatics.
- The panel views Bioinformatics as an activity of central strategic importance for a modern university, and strongly supports the further development of the LCB.

24. Panel 19

24.1 Research in the Faculty of Pharmacy

24.1.1 Preamble

The Faculty of Pharmacy's stated aim has been to embrace all aspects of drug discovery, drug development and drug use, so that its graduates are expert in at least one of these areas. There is a diversity of needs: for pharmacists practicing in hospital, community, industry or research institutions. This endeavour is underpinned by excellent research across the several disciplines of pharmaceutical science and practice.

The panel's task was to evaluate the research and research potential of the Faculty. It found several nodes of established international excellence, examples of very innovative research, much else of a high standard and virtually all endeavours relevant to the discipline. It also identified areas which were in need of renewal because of their importance to the mission of the Faculty.

The Faculty enjoys excellent physical facilities and modern instrumentation, is embedded in a prestigious multifaceted University and is closely aligned at least administratively to the Faculty of Medicine. The panel did not always see that the potential for interactions with, or sometimes within, departments of the Faculty of Pharmacy were realised. More could be made of ties with Medicine and also with departments of the Faculty of Science, while preserving the unique identity of pharmacy.

It was clear that there were, however, some impediments to realising the full research potential of the Faculty, that is in supporting success and in providing clear career pathways for young scientists. The former large number of departments had been rationalised to the three that exist today, but the overtones of history were evident in the departmental structures. Each departmental chairman retains a degree of autonomy, but research groups appeared at times to be mini-fiefdoms. There did not seem to be a clear mechanism to allow the Dean to exercise strategic oversight of the Faculty. Indeed, it appeared strange to us that Deans do not appear in the University's organogram.

Strong leadership is essential to ensure change. The panel felt strongly that the arrangements should be re-examined so that the Dean has funds and authority to implement change. Lacking also was a Faculty-wide strategic plan for the next 5-10 years. Succession planning was an issue in at least one department. Pre-emptive appointments might be necessary in some cases. More planning has to be conducted *across the faculty* to allow the emergence of new

subjects not tied to existing boundaries and structures. Subdivision hindered significant change. More attention should be paid to leadership at departmental level.

A Faculty Research Committee was essential to ensure that opportunities for new funding and innovation were not missed. The growth of some areas suggests the need for enhance computational, analytical and other facilities that can be shared by the whole faculty.

The cost to departments of space, in particular for undergraduate teaching, placed heavy burdens on departments with essential teaching loads in diverse laboratories. Our view was that the Faculty should engage in a strategic review, not only of research, but also of structure and funding mechanisms, so that means could be found across the faculty for significant investment in areas perhaps not connected to a single department.

24.2 Department of Pharmaceutical Biosciences

24.2.1 Pharmaceutical informatics

Proteochemometrics is an emerging methodology to assess interactions between proteins and small molecules as in receptor-ligand interactions. The merging of chemoinformatics with bioinformatics enabled by the Bioclipse project has been highly successful. It is currently being further developed as a joint effort between Uppsala and several universities. The research in the department covers a broad range of activities from synthesis of small target molecules to the development of improved algorithms and software.

Pharmacometrics is of high relevance to the pharmaceutical industry, in the development of new drugs and for optimising therapies of marketed drugs. Models of drug dose, drug exposure and pharmacological effect in selected therapeutic areas had been developed, and has attracted wide interest. Research is focused on refinement of the models. Pharmacometric models for the future will be more complex than those existing today and this requires new approaches in model development.

Research in pharmaceutical informatics is evidently very successful. We judge this area to be a highly promising one. Model-based research is most likely a route for the future in pharmaceutical development. It is clearly a core research activity for a faculty of pharmacy. We were pleased to hear that the two presenting groups are now behind a joint application for a Linnéstöd.

1. We recommend that the groups are given all possible support from the University. We also recommend that the two groups collaborate more in the future than they have done in the past.

24.2.2 Drug Safety

Bioinformatics tools are applied for analysis of gene and protein regulation with a view to develop *in vitro* test systems. Another approach originates from the question: is development toxicology the solution for early identification of teratogenic compounds? *In vitro* test systems are being developed by the use of human and murine stem cells. The research is based on extensive collaboration with other groups, in particular the Mass Spectrometry Centre. The research is relevant for the drug development process and has a high potential with regard to novelty as well as successful development of *in vitro* test systems.

2. We consider that research in drug safety merits Faculty support in renewal.

24.2.3 Neuroscience and drug dependence

Research activities in neuroscience and drug dependence although developed independently, are well integrated and focused on the comprehension of drug addiction mechanisms. They have a great potential to influence novel therapeutic strategies. Research is of top quality and productive, studying endogenous substances which may counteract tolerance to chronic opioids and abstinence reactions or that can help to reverse negative effects of opioids on neurogenesis. High quality investigations on alcohol dependence are important in the search for novel drug treatments. There is world-leading expertise to study opioid transport through the blood-brain barrier by microdialysis, PET and brain slice techniques.

3. Neuroscience is an important area of research in Uppsala which deserves continued support.

24.2.4 Metabolism

Drug metabolism research is central in drug discovery and development and may therefore be considered a key research area in a pharmacy faculty. Basic biochemical mechanistic research is carried out. Two of the “groups” consisted of a single person (with a few PhD students) and the third group had two senior scientists and a few PhD students. Although the research presented was of a high standard, action should be taken in order to stimulate collaboration and the generation of mutual research projects in drug metabolism, possibly together with other groups in the faculty.

4. We recommend that the department should consider how the three research groups working in drug metabolism can be brought closer together

24.2.5 Conclusions

The Department identified two areas considered to be vital for the future: pharmaceutical informatics (presently proteochemometrics and pharmacometrics) and the neuropharmacology of drug addiction. The panel concurred and added a third, that of drug safety, especially as this was being extended to explore not only drugs but pharmaceutical nanocarriers, an area which will become of increasing interest in the bioscience field.

24.3 Department of Pharmacy

24.3.1 Social pharmacy and pharmacy practice research

Research in these areas involves two groups with overlapping research themes. The Pharmacoepidemiology and Pharmacoeconomics group is currently small, lacking critical mass. The scope of interests of the group is too large for its size. It has a good track record from the 1990's in large database and epidemiological studies, which would be a natural path to follow in the future. Strengthening the group with PhD students and strategic collaboration is necessary.

The Pharmaceutical Outcomes Research group, more recently established, has a better situation with fairly good external funding and an improving research output. The research of the group is of good quality, but too fragmented to make a major scientific impact. The future success of the group depends on the ability to concentrate on fewer themes and collaboration with groups in the pharmacy and medical faculties.

Both groups are independently carrying out "quality of life" studies without collaborating. While pharmacoeconomics is an important field and there is much demand for such research, the Pharmacoepidemiology and Pharmacoeconomics group is currently too small to be able to compete successfully in this field. While Sweden has a strong tradition in health economics, there are topics within pharmacoeconomic research that could fit well into the present research done at the Faculty.

5. We advise that the future success of the two groups depends on their ability to focus and concentrate on their strengths, and on genuine collaboration between them, but also on strategic collaboration with cognate groups in the Faculty of Medicine.

24.3.2 Pharmaceuticals

Research within the pharmaceuticals group aims to develop formulation tools for effective product development and manufacture. With a starting point in particle and powder technology and solid dosage form technology the direction of research has now been changed towards particle engineering and mod-

eling of pharmaceutical processes. Renewal actions include interdisciplinary collaborations, e.g. within material sciences, to support materials characterization and development of an improved theoretical framework for the design and processing of solid dosage forms. Further, the renewal is supported by recruitment to post-doctoral positions. The group has at its disposal very good research facilities. Funding by the pharmaceutical industry has diminished in recent years. The renewal process is therefore seen as a means to improve funding from other sources.

The research is of high quality and is internationally recognized. Development of a pharmaceutical physics expertise is commendable.

24.3.3 Biopharmaceutics

The biopharmaceutics research group has a high international standing. A wide international and interdisciplinary network of collaborating partners has been established. The research is well funded from industrial and public sources.

Biopharmacy oriented towards pharmacokinetics is a core discipline within pharmaceutical sciences. The current situation, with part-time employment of one leading professor should be improved by full integration of the professor into the activities of the department and efforts made to employ further teaching and research staff.

24.3.4 Physical Chemistry

Revived by the appointment of a new professor in 2003, focus is on the biophysical properties of antimicrobial peptides, SAR and biophysical studies of their modes of action. Formulation of these peptides in polymer hydrogels and lipid particles is an important task. It is essential for a Faculty of Pharmacy to have an active physical chemistry group. This is a promising research activity, clearly in its relative infancy, which should be given time to flourish.

24.3.5 Drug Delivery

The drug delivery group has a high international standing. It has pioneered world-leading techniques for tissue culture in relation to drug transport and continues to work in this vital area. Recently the decision had been taken to focus on its strengths and this we commend. The group continues to pioneer specialised culture techniques for transport studies which are adopted by laboratories across the world.

24.3.6 Conclusion

The department has several strong successful groups which must continue to be supported.

6. We recommend that further efforts are made to secure external funds to support the excellent work in biopharmaceutics, physical chemistry and drug delivery.

24.4 Department of Medicinal Chemistry

24.4.1 Analytical Pharmaceutical Chemistry

This division has a long tradition with excellent research in separation science for pharmaceutical and biomedical analysis. In particular, the group has a high reputation in chiral analysis and in more fundamental aspects of modern separation techniques. However during the last years there has been a clear decrease in output. This seems partly related to the high teaching load as a result of the abrupt reduction in senior staff complement, but also to the lack of success in obtaining external funding. New initiatives and cooperation are now evident but a clear choice for a focus area must be made.

The field of metabonomics including biomarkers is attractive because expertise in separation techniques, mass spectrometry, NMR and chemometrics is required and partly available. The group should have easy access to high-level MS and NMR facilities. Good partners from biological/clinical laboratories should be sought.

7. The Faculty, supported by the University, must make key decisions in the coming year on the direction of this important division. A pre-emptive appointment should be considered anticipating the retirement of a senior professor.

24.4.2 Pharmacognosy

The division of pharmacognosy is (and has been for some time) in the process of modernisation moving to a up to date form of natural product chemistry using current analytical chemical instrumental methods as well as bioassays. The division has an ambition to cover a very broad range of activities. But, for this relatively small group, it may be an advantage to concentrate on fewer projects to achieve their potential.

The combination of the search for new bioactive natural product substances using chemoinformatics and phylogenetic analysis are new promising initiatives that may bring about new knowledge.

8. We recommend increased interaction between pharmacognosy and the neighbouring analytical pharmaceutical chemistry division.

24.4.3 Organic Pharmaceutical Chemistry

The Division of Organic Pharmaceutical Chemistry is a strong unit with several senior people, many PhD students and good financing both from internal and external sources. The work is dominated by drug discovery research, which involves computer-based design of small molecules followed by synthesis. The output of the research is impressive with a steady stream of publications in good journals. The long-term funding from both the Swedish Research Council and industry is an indication that the group manages to maintain an activity that is at the same time scientifically strong and applied in character. The group has a broad network with adequate collaborations with industry as well as with academic groups both within the faculty and at other universities.

The Vice-Chancellor has been the key scientist behind the present activities. There are plans to recruit two new professors to the group, which we strongly encourage. However, the panel questioned whether appointments in the fields of computational chemistry and combinatorial chemistry were the best way forward. It is of utmost importance for the division and the department that a successor is found who can take over leadership of a large research group with a very strong international standing.

9. We recommend the Faculty conducts a search for an excellent preparative medicinal chemist as lead professor.

24.4.4 Conclusion

The department has some successful and prestigious groups, but there are considerable uncertainties over the future development of the analytical and organic chemistry units, which need resolution.

24.4.5 Environment for PhD students and young scientists

Generally the PhD candidates were content with the facilities and supervision, recognising that supervisors were busy. They had all had an introduction to PhD studies and had a voice in decision making in the department. Most had availed themselves of opportunities to study abroad and all had attended an ULLA summer school. Some felt that there was too much recruitment of Swedish PhD students and they hoped for more international recruitment in the future. Some praised the intellectual environment, the stimulus of teaching, supervising diploma students and their own research.

The young scientists (directly after PhD) partly paid by the University and partly by external funding, have a variable teaching load, some postdoctoral staff not being involved in teaching. For development of an individual research profile it should often be preferred that the scientists are only doing research. Generally the young scientists were very positive about the facilities and infrastructure in the BMC but they would like to have more secure continuity.

This is important both for the research output and for the selection of the right people for future academic positions. Both PhDs and young scientists overcome the divisions between sections. In conclusion, good possibilities for young researchers should now be a high priority

10. We advise the Faculty of Pharmacy with the University authorities to develop a strategy for young scientists.

24.4.6 Facilities and Infrastructure

Some general facilities are required for the research in the Faculty. A high-level computer infrastructure and suitable personnel (software engineers) are very important for promising research activities (proteochemometrics, pharmacometrics, bioinformatics, chemoinformatics, pharmaceutical informatics). Investments in this area should take place and the facilities should be available for people from different disciplines.

All the Departments need advanced analytical instruments such as mass spectrometry and NMR. Next to relatively small apparatus which can be used by one division, it seems efficient to build a centre with more expensive instruments and a few experts/technicians. Long-term planning for new apparatus and a users group will be very useful for such an analytical centre. It would be interesting if these facilities can also function as a so-called analytical hotel in which researchers from different departments can work for a certain time. Facilities such as the Mass spectrometry in the University are very good but of low capacity.

11. The panel recommends collaboration in the development of mass spectrometry between the relevant Faculties.

24.4.7 Other points

The Faculty was seen to be well funded with respect to PhD students in relation to other Swedish Universities. There is a need for rationalisation in some areas, infusion of a greater desire for staff to work together in new fields outside today's boundaries and to revitalise some fields. It is hoped that this report will stimulate a Faculty of Pharmacy-wide elaboration of a strategic plan for the years 2007-2012 and beyond.

12. We recommend that the Faculty of Pharmacy initiates a Strategic Review of its priorities and missions for the period 2007-2012.

24.4.8 Acknowledgements

The panel thanks all the staff of the Faculty of Pharmacy and the University for their assistance in providing information, support and access to make this exercise informed and positive.

25. Panel 20

25.1 Department of Medical Cell Biology

25.1.1 General assessment

This unit has been merged from the former Departments of Anatomy, Medical Cell Biology (MCB, previously Histology) and part of Physiology. A considerable body of very good work has been carried out. However, the overall quality appears uneven. We identified the recent exciting work by Dr. **A. Tengholm** as being top quality research. The major research areas are experimental diabetology, which covers about 2/3 of the activities, and respiratory, kidney and gastrointestinal diseases. In 2006 the number of active researchers in the department was 42, of these 12 were full professors. In the same year, the number of scientific publications reached 58 papers in peer reviewed journals. Some were published in very highly ranked journals, but most are in specialized journals with impact factors of median or low level.

The Head of the Department, prof. **Arne Andersson**, and particularly the Vice Head for Research education, prof. **Erik Gylfes**, were helpful during our assessments.

25.1.2 Quality of research in experimental diabetology

The individual contributions of the major groups are assessed here by expert Panel members. More than 2/3 of the research produced by MCB is within experimental diabetology and within this area insulin secretion mechanisms has the highest priority. The group has a tradition for such research, where they have produced results of a high international level for about 40 years. Two internationally well known scientists have graduated from this laboratory, namely Patrick Rorsman and Per-Olof Berggren. The current research on oscillation in insulin secretion related to the oscillation of intracellular Ca^{2+} concentrations is of a high international standard and well recognized. The new technique - ratiometric evanescent-wave-microscopy- developed in Uppsala to study *in vivo* oscillations of metabolites and ions in single cells offers new possibilities and has resulted in the novel original observation that c-AMP oscillates in beta cells in concert with Ca^{2+} and insulin. The finding recently resulted in a publication in *Nature*, and a key individual for the development of the technique and its original results is Anders Tengholm, the first author. He is now a central person in the future development of this area at the MCB, although Eric Gylfe was involved in the preceding investigations of Ca^{2+} os-

cillations. With the new technique, Tengholm and co-workers may have the potential for uncovering defects in beta cells from both Type 1 and Type 2 diabetes subjects. Furthermore, there is promise for collaboration with the islets transplantation group.

Dr. **Peter Bergsten** presented a new approach to beta cell investigation, namely proteomic analysis of proteins upregulated by free fatty acids, a powerful tool. Most preceding studies have been carried out with 2D gel electrophoresis, which by itself is not an optimal technique. Improved collaboration with the core facility of mass spectrometry for analysing results appears, however, to be needed.

Type 1 diabetes - pathogenetic mechanisms

The Sandler group, including the innovative Welsh brothers, has for several years studied the pathogenetics of islet cell destruction in type 1 diabetes. They introduced molecular biology as a tool and have obtained significant results. Recently this group found that islets, despite autoimmune attacks, may regenerate in some subjects. Stimulation of this regenerative capacity of beta cells may be a new way of treatment of the disease, but may also have use in prevention. They concentrate on investigation of the cellular mechanisms behind the regenerative process. Specifically, Dr. **Niels Welsh** addresses this problem, and his results are both original and promising, and reach a high international level. The work of Dr. **Michael Welsh** involving transgenic mice is also original and interesting. He contributes needed genetical expertise, but seems slightly out of focus when dealing with the beta cell regeneration project. Dr. **S. Sandler** described original and intriguing studies on a picornavirus that induces diabetes in bank voles (and also mice) and proliferates in beta cells. This could be a potentially useful model system. Islet transplantation

Dr. **Leif Jansson** and his coworkers presented the basic islet transplantation research carried out at MCB, where they specifically have focused on improving the blood flow in islets in different situations, finding a correlation with blood flow in fat tissue. These results on islet transplantation in animals are of interest and may lend support to the clinical implantation of human islets. It seems obvious to propose a merger of the above activities to obtain synergy and reach thereby a higher international level.

Diabetic complications

Two projects were presented on this topic, namely investigations of malformations in diabetic pregnancy in rats and diabetic nephropathy, also carried out in rats. Both projects might benefit by focusing more on humans. They seem to be out of focus when compared to the main interest of other researchers in the center. These subgroups are small and although they produce results of an international standard they would benefit from collaboration with other groups that concentrate on diabetic complications.

Conclusion

- The general impression is that the diabetes research profile of the MBC group now is too broad. More focus on the key issues is recommended.
- The group needs to collaborate with the clinical center for islet transplantation to obtain synergy.
- International collaborations could be improved.
- The visit produced only a cursory impression of the junior faculty activities.
- There seems to be room for more post-doctoral positions.

Based on the terms of reference given by the university our overall rating is: International high standard, with the insulin secretion group reaching the top quality.

25.1.3 Kidney, gastrointestinal, and lung functions

General

Physiology allows the understanding of organ function in the body. It is a basic discipline in medicine and indispensable for teaching and research. Processes like homeostasis of water and electrolyte metabolism, gas exchange in the lung, resorption of nutrients from the gut, blood pressure and organ perfusion have to be known in order to recognise pathological deviations from normal function. Pharmacology is a discipline that attempts to develop drugs to treat diseases, often based on the identification of structures that can be modified by chemical substances. Would not the Medical Faculty of Uppsala University benefit from having an integrated Department for Physiology and Pharmacology? Since the BMC houses several research groups that are concerned with physiological and pharmacological topics, it is desirable that experimental skills, classically established in these fields, should be available for development of appropriate disease models and experimental therapy, and be part of the Department of Medical Cell Biology.

Specific points

Kidney research

Professor **Erik Persson** is a senior, internationally well-known established physiologist in the field of kidney and blood pressure regulation. In the last five years, 2007 inclusive, he has published 33 publications of which 15 are in the best journals of the field. One of his major contributions is the elucidation of complex mechanisms of tubulo-glomerular feedback (TGF). TGF is involved in regulation of glomerular filtration and renin secretion; both elements are essential for homeostasis of blood pressure. He has recently contributed to the field of insulin secretion using the micropuncture technique, which he originally developed for assessing nephron function. He is well funded for

his research. His present project to characterize the pathophysiology of hydronephrosis should be supported since our understanding of the progressive loss of renal function in hydronephrosis is limited.

Gastrointestinal research

In this project, the physiology of the mucosal barrier is being carefully analysed by **Lena Holm** in order to provide further insights into gastro-duodenal ulceration. This project might obtain international reputation with appropriate support, but at present appears to be another small group struggling to achieve a critical mass.

Cystic fibrosis research

In this research project, headed by Dr. **Godfried Roomans**, new principles of diagnosis and therapy of cystic fibrosis (CF) are being developed. The disease symptoms affect all fluid and mucus secreting epithelia of the lung and gastrointestinal tract. The group has developed a diagnostic method to measure the electrolyte concentration in secreted mucus that allows mucus samples, collected from affected patients living far away from Uppsala, to be analysed in their laboratory. This method also permits the therapeutic efficacy of new treatments to be monitored. The most promising therapeutic regimen will be the administration of S-nitrosoglutathione. The group is small and may not have a critical mass, but appears to be appropriately funded, and enjoys several cooperations with other centres for the management of CF. The project has the additional advantage of cooperation with the pharmaceutical industry. A key member of this team is Dr. **Anca Dragomir**, an MD. Her expertise helps in the attempted implementation of new therapies.

Research environment and infrastructure

As is often the case with merged departments, there is considerable heterogeneity in the lines of research being pursued. A good focus on diabetes and hormone secretion is the main theme of the Department, but other research areas by comparison appear to suffer either from a lack of a critical mass, insufficient funding, or want of collaborations.

Opportunities for renewal and emerging science

The recent cell biology work of A. Tengholm and coworkers offers extension of novel technical approaches to other urgent scientific problems in signal transduction research. This unique opportunity could be a good basis for collaboration with other groups and departments at Uppsala University.

With the pending retirement of prof. Erik Persson, it was not clear that the department will retain its considerable tradition of expertise in kidney physiology. The future and succession in this area requires detailed and urgent consideration.

Actions for successful development

It seems important and relevant to retain classical physiological techniques and approaches in the department, in addition to the very good cell biological investigations. If possible, recruitment of a high proportion of medically trained graduate students and junior staff should help such initiatives. We note comments received from this department on uneven teaching loads that might delay new developments. This should, and undoubtedly will, be considered by the Head and Vice Heads of the Department.

25.2 Department of Medical Biochemistry and Microbiology

25.2.1 General assessment

This is an excellent and well-administered large department with several lines of important research. There is a good balance between senior and junior group heads, and between female and male scientific staff. In 2006, the number of active researchers in the department was 63, of these 13 were full professors; the number of scientific publications was 79 in peer reviewed journals.

A particular research strength of this department is its long-term commitment to glycobiology, initiated under the previous chairman prof. Torvard Laurent, successfully continued by prof. Ulf Lindahl, and most recently by prof. Lena Kjellén. The department is a world-leading institution for research in this field, with emphasis on heparan sulphate. The relatively recent recruitments of professors L. Andersson and D. Andersson has further strengthened the excellence and broad impact of the department. In summary, we identified as groups of the highest international standard those of Kjellén/Lindahl, L. Andersson, and D. Andersson.

25.2.2 Quality of research

This main section of the report considers the individual contributions of the various groups, as assessed by “Panel 20” members.

Glycobiology

- **Professor Lena Kjellén**
- **Dorothe Spillmann, Ph.D.**
- **Professor em. Ulf Lindahl**

Carbohydrate biochemistry has a long tradition in Uppsala University. Specifically, proteoglycan research has been and still is a major subject of research. The evaluation panel listened to the three presentations by the above mentioned scientists. Lena Kjellén is the acting professor now that Lindahl has retired. He is still, however, very active in research.

The biosynthesis of heparan sulfate has largely been worked out in the Department of Medical Biochemistry and Microbiology. It is extremely complex and involves a number of enzymes showing high specificity. These include enzymes acting on deacetylation, sulfation, polymerization and epimerization. The group is continuing this work on regulatory control, often using highly sophisticated methods. Interestingly, the heparan sulfates are different when isolated from individual tissues of a specific animal. The group, by immunoprecipitation, has some evidence for the presence of a biosynthesis complex, a “GAGosome”, and if this proves to be the case, it will be a major advance. The group has several mouse knock-out (k.o.) models, some of which show clear phenotypes and they have also obtained highly specific antibodies using phage display. Several growth factors bind to proteoglycans including heparan sulfate, and the binding requirements for fibroblast growth factor have been extensively studied by the group. Evidently, the negative charge of the proteoglycans is the major factor. They have also studied the interaction of platelet-derived growth factor (PDGF) with heparan sulfate, where the binding region is distinct from that of fibroblast growth factor, FGF. In this work they have cooperated with other well-known workers in the field. The use of k.o. animals deficient in heparan sulfate biosynthetic enzymes has turned out very rewarding. Some show lethal effects, but others have more specific alterations. For example, epimerase k.o. animals show skeletal abnormalities. The group also has organ-specific knockouts. Attempted sequencing of heparan sulfates by atomic force spectroscopy is one of several intriguing future challenges. Although most of the work is basic biochemistry and molecular/cell biology, the work has strong connections to medicine and several applications of their work are possible. These include interference with red cell aggregation in cerebral malaria using modified fragments, and shorter birth delivery times. Another interesting and potentially exciting application is the inhibition of amyloid plaque formation by heparanase treatment. This novel and imaginative research was supervised by Dr. **Jin-Ping Li**, who was unfortunately unable to participate in the review. The departmental cooperation with clinical scientists should preferably be developed further.

The panel is of the opinion that the glycobiology research should be strongly supported in Uppsala University. It is evident that carbohydrates play several important roles in a variety of physiologically important functions and the Uppsala group is uniquely successful. Certainly, more applications can be expected in the future. The group belongs to category 1: “Top-quality or world-leading research” in its own field. Importantly, the panel sees that the successful work can continue because the younger scientists taking over after Ulf Lindahl are highly motivated and the scientific atmosphere appears excellent.

Tumour Biology

The research performed in the “Tumour Biology” -section of the Biochemistry department is focused on integrin-type adhesion receptors, tumour stroma and neural stem cells.

The research group of Dr. **Karin Forsberg-Nilsson** studies the role of neural progenitor or stem cells in the origin of brain tumors. It is also interested in the effect of PDGF on stem cells, stem cell migration in brain and interactions of stem cells with the extracellular matrix. This group has produced excellent papers in good journals. The panel found this project very interesting and rated it as “Internationally high standard”. The project was estimated to have a good probability of producing important future results, but would benefit from a closer relationship with other neuroscience researchers in the campus area. Dr. Forsberg-Nilsson is also the head of the Uppsala University Transgenic Facility. It would be important for the future of this group she could concentrate on her research without heavy teaching or administrative duties.

Dr. **Staffan Johansson’s** research group studies integrin-mediated cell signalling. Although the integrin signalling field is highly competitive, Dr. Johansson’s group produces good quality papers that are published in recognised international journals.

Dr. **Kristoffer Rubin’s** “Tumour Stroma” group is working with questions related to the interaction of cancer cells with the neighbouring extracellular matrix and loose connective tissue. The results of the group suggest that integrin mediated cell-collagen interaction regulates interstitial fluid pressure. The model is interesting, and there are ongoing attempts to further validate it in *in vivo* assays.

In general, it is deemed essential for the “Tumour Biology” -section to establish close connections to other cancer biology -related groups in the University.

Profs. **Leif Andersson** and **Hans Ronne** represent functional genetics within IMBIM. Together their groups consist of some 30 individuals at various levels of their academic career.

The study of the genetic basis for phenotypic variation is an interesting approach to exploit the limited genetic variability within different strains of domesticated animals. Leif Andersson has pioneered this field and made several very important contributions that are published in the highest ranked journals. The concept of using farm animals to identify disease relevant mutations constitutes a unique niche of great strategic importance for Uppsala University. The identification of a regulatory mutation in the *IGF2* locus that affects fat deposition and muscle mass in pigs is an excellent example on how Quantitative Trait Loci, QTLs, can be identified by crossing a partially inbred domesticated animal (pig) with its wild type counterpart (wild boar). In this way many of the problems encountered in similar studies of humans due to the high degree of genetic variation in highly outbred human populations are avoided. This topic brings together researchers, animal models and

expertise from both Uppsala University and the Swedish University of Agricultural Sciences (SLU). The panel regards this as an important strategic alliance. Among several excellent collaborations we point out the work on the dog genome together with Eric Lander at the Broad Institute in Cambridge, Massachusetts. The approach to localize a disease gene in dogs shows great promise, since it might obviate the time-consuming family studies necessary in humans. The future direction to study complex phenotypes e.g. type 2 diabetes is also deemed to be of great significance. The recruitment of Dr. Kerstin Lindblad-Toth, presently at the Broad Institute, is greatly supported. Prof. Leif Andersson is a world-leading scientist in his field. His work is highly innovative and seminal to this area of genetics with bearings on several important disease areas.

Prof. Ronne has a high international standing in the field of yeast genetics and he is well known for his work on jumonji domain histone demethylases. His gene knock-out (k.o.) experiments with the metabolic master switch, AMP-activated protein kinase, in the moss *Physcomitrella patens* are novel and interesting. It is noteworthy that it is much easier to construct double knock-outs in this organism than in comparable systems such as *Arabidopsis*. It appears that both these research groups share a common interest in metabolism and its regulation. A combined effort using yeast, *Physcomitrella* and farm animals could prove to be an efficient way to study complex phenotypes and their genetic origin.

Dr. **P. Bjerling** performs good work in the very competitive area of chromatin organization in yeast but seems insufficiently integrated with the two major groups.

Protein Biochemistry

Dr. **Per Jemth** is the young leader of a group focused on protein science. He shows great enthusiasm for his work. The group is interested in protein folding, especially the relationship between ligand binding and folding. The PDZ domain has been one of their model structures. Dr. Jemth's research group within Uppsala is only three years-old, but they have already produced papers in good quality journals, and Dr. Jemth has created an impressive network of international collaborations. The group should also take full advantage of the local facilities and expertise at Uppsala University. In the future it is important that the project finds its own special niche in the competitive field of protein folding.

Dr. **Erik Fries's** group is studying the structure, function, synthesis and evolution of haptoglobin, a well-known haemoglobin binding protein that also participates in the host defence response to infection and inflammation. The exact mechanisms of haptoglobin action are poorly understood. Dr. Fries has found a novel haptoglobin-processing proteinase in the endoplasmic reticulum. The small group has limited resources, but publishes in good quality journals. Their future goals include the functional analysis of haptoglobin by

amino acid replacements and the crystallisation of haptoglobin. It would be easier to predict the biological significance of the results if the research could be expanded to consider also the intriguing *in vivo* functions of haptoglobin.

Prof. **Dan Andersson** and **Ann-Beth Jonsson** represent Molecular Bacteriology within IMBIM.

Prof. D. Andersson's group consists of 4 postdoctoral fellows and 6 graduate students. Its main focus is on factors that influence the tempo and mode of bacterial evolution. Several models were discussed. The evolution and dynamics of bacterial antibiotic resistance in *Salmonella*, also in *Helicobacter* and *Staphylococcus*, is judged to be of considerable scientific and clinical importance. The recent investigations of peptide deformylase inhibitors as a new class of antibiotics also shows considerable promise. Another interesting approach, possibly more of a diverse high risk project, is an experimental method to evolve novel genes based on gene amplification in adaptive responses. Here collaboration with the Center for Evolutionary Biology in Uppsala might prove beneficial. Prof. D. Andersson is a world-leading researcher in his field. He has an impressive publication record with papers in top-ranked journals. In particular, focussed investigations on the rate of evolution of antibiotic resistance promise original approaches to this clinically important topic.

Unfortunately, Dr. Ann-Beth Jonsson was not available to present her research to the panel. Instead, this was done by junior collaborators. Her work on bacterial pathogenesis and cell signaling appears to be of high international standard and she has an impressive publication record. The transgenic mouse expressing human CD46, previously used by others to study viral infections, was applied by Dr. Jonsson as model for human infections caused by *Neisseria meningitidis*. This is an important contribution to further understanding of this often fatal condition. However, the panel feels that the research profile of this group is too broad and divergent and would benefit from a more focused approach to microbial pathogenesis.

Univ. lektor **Göte Swedberg** continues a tradition of this department in research on antibiotic resistance. His search for new drug targets and fieldwork in Africa on malaria and its treatment is interesting and represents a translational effort to apply basic science in a public health perspective. He is part of a larger collaborative research effort between Sweden and sub-Saharan Africa, but does not appear to be allied to others in the department.

25.2.3 Molecular Virology, within IMBIM

Virology - especially the study of the oncogenic adenovirus - has played a major role in the scientific life of Uppsala Universitet for some considerable time. Today, as presented to our panel, it remains strong in one sense, that is, it consists of good internationally-competitive research. However, being relatively starved of personnel and funding, it shows 'signs of distress'. There

Professors: Göran Akusjärvi
 Göran Magnusson
 Stephan Schwartz
 (together with Jonas Blomberg)
Assoc. prof: Catharina Svensson

were no obvious promising junior researchers identified among the academic staff in this Division.

In our review, Molecular Virology was not ranked among the star performers under review, although individual work stood out. The Panel noted for special commendation that of **Göran Akusjärvi**. He and his group maintain strength in adenovirus research and work to an internationally high standard. One of their projects is critical to understanding how viral gene expression is controlled. Its “quality” is linked to past research but in projection extends into the future in a manner that involves elucidating viral and cellular interactions, and how the former acts to usurp functions of the latter. This work may have general applications to other viral systems, beyond adenovirus, in that it involves the general topics of gene ‘splicing’ and virus expression in human cells. The second Akusjärvi group project is based on its original findings first published in 2005 (in at present the highest ranked virological journal), but yet more relevant today. These relate to the functions of two highly expressed small non-coding adenovirus RNAs called VA RNAs I and II. The expression of these RNAs, or one at least of them, has been linked to protein synthesis and interferon responsiveness of infected cells. But, until their 2005 publication, a function for the other has remained elusive. This group proposes separate, discrete, activities for the two VA RNAs and link their functions to those of small interfering (i) RNAs. Their original findings may be related to the oncogenic activities of adenovirus, and should lead on to interesting and biologically relevant follow-up work. As such, they may be deemed to belong to ‘renewal’, that is, the future. The work merits strong support.

Three other projects were presented from the Molecular Virology Department - all deemed worthy of continued support - but, for one reason or another, not ranked in the same category with those from the Akusjärvi group.

One of these projects, briefly presented by **Catharina Svensson**, involves characterisation of interactions between an adenovirus key regulatory gene, E1A, with host cell gene products. Many interactive relationships have been identified but one of them, CtBP, a transcriptional co-repressor, has been targeted for further studies. This work has involved a search for interacting genes using microarrays, in a collaborative study with Prof. Ulf Pettersson at the Rudbeck laboratories. Dr. Svensson has a small group working with her, and in addition, carries out administrative work. As part of a larger research unit,

she has several publications on the interactions between E1A (mainly) and host genes in virological journals.

Stephan Schwartz's presentation focussed mainly on the major oncogenic papillomavirus strain, HPV-16, and studies on DNA replication and blocks to viral late gene expression. This work has obvious relevance for expression of viral genes that may be recognized and contained by the host immune system, and combating tumours induced by HPV-16. He has shown that inactivation of some splicing elements can promote a switch from viral 'early' to 'late' (i.e. capsid protein) gene expression; identification of the cellular proteins involved is now a priority. His studies are of potential relevance both to cancer control and also - by attempted development of an *in vitro* tissue culture system for studying the full lytic process associated with HPV infection of human cells - the temporal expression of the viral genes. His current publication record is good and, with adequate support, his research should continue to make important contributions to future work within this department.

The final project presented, that of **Göran Magnusson**, using the mouse oncogenic polyomavirus, also contains unique, potentially novel work. It addresses questions with regard to viral replication. He, and an assistant, ask questions about why gene mutations are unevenly clustered around the viral origin of replication and in particular around a transcriptional enhancer region. His future work should lead to relevant information on the role of DNA repair in viral mutational 'hotspots' encountered during lytic replication, and roles for crucial host genes - to be identified - recruited to these sites during both replication and transcription. This could turn out to be an important system to clarify the resolution of stalled replication forks. The studies may be applied to other than polyomaviruses and Dr. Magnusson is addressing this question. However, as present Chairman of Medical Biochemistry and Microbiology, he must undoubtedly have only limited time to give to research.

Notably, the panel recognised that the fundamental and important questions being raised on gene expression and control in several key oncogenic DNA viruses, and interactions with host cell genes, was not supported by a critical research mass. DNA viruses have suffered financially in recent years in large part due to the emphasis in research councils on RNA viruses, particularly HIV, SARs, etc. and although Molecular Virology has maintained a good research base, without a critical mass it is increasingly difficult for it to be internationally highly competitive.

One way to add more support is through additional, alternatively-funded, staff. And presumably with this in mind, Prof **J. Blomberg**, a clinical virologist, presented his work on endogenous retrovirus sequences (within the host genome) to the panel, with the (presumed) implication that he might move to IMBIM. Dr. Blomberg's work aims at diagnostic problems and Bioinformatics; although novel, and in its many aspects original and presumably innovative, it did not seem to the Panel to fulfil the need identified for Molecular Virology. From a scientific point of view, it might prove yet that of another small

independent group which does not contribute to the “critical mass” need noted by the panel. Fulfilling this need probably requires support more cognizant of, and related to, the topics ongoing in the Department. If Dr. Blomberg himself is seeking colleagues - and this we do not know - it seemed to the panel that a more suitable choice might lie with an association elsewhere, directly concerned with the more clinically relevant matters implicit in some of his research.

Research environment and infrastructure. Networks and collaborations.

Professors Göran Magnusson and Ulf Lindahl have clearly contributed in an important and positive way to generate a very good and interactive working atmosphere. There does not appear to be a space problem. While there are several small groups with diverse interests, many of these collaborate in a constructive way with scientific colleagues, both within and outside the department, but others need support.

The group of prof. U. Lindahl has had recent substantial collaboration with the medical/pharmaceutical industry, which has been constructive and has contributed to the funding of research in the department.

Opportunity for renewal and emerging science.

In spite of its successful track record, the Department now appears somewhat too broad in its many different research interests. For this reason, it seems important that new recruitments, e.g. to replace professors who retire, should preferentially be made in research areas that complement and underpin the ongoing research, rather than in completely new areas of investigation. The Department Chairman and the University Administration should play important roles in such efforts. We commend the excellent initiative to retain the world-leading position of the development in Glycobiology by the appointment of prof. Kjellén to replace prof. Lindahl.

Actions for successful development

In view of the high standing of the research of the department, it would certainly defend its position if it would be designated and singled out as a Center of Excellence in a specific area. Such a move could further conserve the strongest research groups, and lead to increased publicity for the department. At present, the Glycobiology unit of Kjellén/Lindahl first comes to mind, in view of its impressive long-term track record. Similar high profile groupings for the outstanding research performed on the molecular biology of large inbred domestic animals as models of inherited disease, and the development of antibiotic resistance, are in progress. These could be exciting targets for future developments. There is the potential for other alignments.

An excellent initiative of this Department has been to produce an Annual Report every year since 1999. This concise and informative document was very helpful to our group of reviewers - by comparison, the Internet informa-

tion that was provided was either too meager and cursory, or too massive and unsorted. More importantly, and we feel of relevance to Uppsala University, an impressive Annual Report available both as a hard copy and on the Net greatly increases the visibility and reputation of a good department, and is a good recruitment tool at all scientific levels. We recommend that other Science Departments at Uppsala University should seriously consider the production of an Annual Report modelled on that of the Department of Biochemistry and Microbiology.

26. Panel 21

26.1 Public Health and Caring Sciences

26.1.1 Background

Panel 21's evaluation activity was devoted mainly to the Department of Public Health and Caring Sciences. This department was formed in 1998 when the medical faculty was restructured. This involved combining previously existing research groups, such as Social medicine and Geriatrics, with newer ones, such as Family Medicine, itself a rather new discipline and academic subject in Sweden during the 80's, with one of the first professorships in Uppsala. In addition, Caring Sciences became part of this department. Hence the department comprising Public Health and Caring Sciences is rather unique, in Sweden and elsewhere.

The panel also visited two other, independent units: the Uppsala Clinical Research Centre and the Centre for E-Health. Finally, the Department of Occupational Medicine, a Nursing group from the Department of Internal Medicine, and the Physiotherapy group from the Department of Neurosciences were also visited.

While evaluating the different departments and research groups, the panel's working methods were based on the written material provided and interviews with staff. The focus taken in the interviews as well as the evaluation was consistently related to 1) the research questions and focus, 2) collaborations held within the faculty, nationally and internationally, 3) mechanisms pursued to ensure research quality, 4) scientific methods used and the methodological strengths or deficiencies, 5) how people were working within the groups and the way leadership takes place, 6) level of external funding, 7) longer term perspectives and renewal priorities, and 8) how the research is embedded in society and its societal relevance.

26.2 Department of Public Health and Caring Sciences, overall evaluation

26.2.1 General assessment of quality and strategy

The research focus of the department could probably be summarized as preventive and behavioural medicine. This is an area of enormous societal interest, with growing recognition and large scientific as well as applied poten-

tial. For being a department of public health, the fields of epidemiology and biostatistics were less well developed. We encountered a number of different research groups of varying quality. Some were of high international standard; others are doing good or acceptable work.

At the same time, different groups are working, across the department, on similar themes. Quite some overlap was seen. The current situation shows a lack of conceptual framework and strategic planning. As a result there is a lack of opportunity to exploit the potential synergies between and within research groups. The manner in which research is organised seems historically driven, rather than the result of a global and shared mission. Having an overall vision of how the different subjects relate, where the common interests lie and how different groups might relate to one another, could create synergy and strongly enhance the effectiveness and impact of the department.

26.2.2 Research environment: quality management

Although within the different groups some mechanisms were seen to improve exchange and further quality, at a department level, such endeavours seem limited. Similarly, no incentives were seen to stimulate collaboration within the department, with other groups in Uppsala and Sweden or internationally. A quality management strategy would be helpful in improving the overall level of research. Additionally, systematic peer review within the department could support individual researchers. Secondly, the panel would like to suggest that a methodological core be organised within the department. Such a core would make methodological and statistical support as well as expertise in the area of qualitative methods available for all the groups involved. Thirdly, organising a link with expertise in the field of health economics could be of great value to the department at large.

26.2.3 Strengths of the department

The department has a number of strengths. First, large data bases are available on a national level, longitudinal studies have been organised and a number of randomised intervention studies have been performed within different groups. Secondly, the centre of bioethics is seen as a unit with the potential of becoming one of the faculty's golden nuggets given the expected ongoing importance of the subject, the excellent work done in this group and the stimulating manner in which the group seems to be working. Finally, the panel found the number of doctoral students working within the department impressive.

26.2.4 Future and renewal

While preventive and behavioural medicine are already of uttermost importance, elements thereof are likely to become increasingly interesting in the

future. As someone put it, ‘The protein will not solve all public health issues.’ Immigration and integration, sexual health, ageing and unemployment are likely to draw attention in the coming years.

In the light of these societal problems and given that different groups have given different accounts of their relation with policy makers, the relation of the department’s work within the political arena could be addressed as an important point.

Also, the role of family medicine is expected to become even more important in coming years. Developing a network of primary care physicians interested in working with academia could result in enormous research advantages for the department and even the faculty at large.

Finally, it is noteworthy that despite being a Public Health priority area internationally, very little mental health related research was presented to the panel by the department.

26.2.5 Actions for successful development

As one participant put it, ‘this is a group of researchers rather than a research group’. One has difficulty finding the synergy within the department. The manner in which the different groups exchange, stimulate each other and learn from each other’s experience, did not become visible and could well be largely absent. At the same time there is much to be gained from collaborating given the subjects and the methods shared. As our observations have highlighted overlap in research areas and the need to find ways to strengthen collaboration, it might be useful to consider incentives and funding that would promote collaboration as opposed to competition or working in isolation.

Doctoral training is strong at the department. There is a vibrant postgraduate community but insufficient career stability. Many go back to clinical work after research training. Among those who stay at the department, there is a tendency to want to set up their own research group often based on reactive funding. Strategic leadership is therefore of great importance.

Finally, the panel had the impression that the way the department is organised may not be stimulating change, especially so when difficult decisions would have to be made. The panel suggests appointing a research director taking a lead in the development of an overall strategy, a quality management programme and synergy among the different groups to enhance the focus and the quality of the work done.

26.3 Department of public health and caring sciences, specific units

26.3.1 Centre for bioethics

General assessment

The Centre for Bioethics involves a multi-disciplinary research group, with co-workers from the fields of philosophy, theology, political science, psychology, medical law, medicine and biology. Important research topics such as patient autonomy, bio banks, neuro-ethics and research governance are being addressed. Given the increasing importance attached to bioethical thinking in medicine this unit is of great importance for the faculty at large.

Quality of research

The centre of bioethics is seen as a unit with the potential of becoming one of the faculty's golden nuggets. The research quality appears to be of internationally high standard and has the potential of becoming world leading. The panel was impressed by the Centre's productivity, the excellent work done in this group and the manner in which the group seems to be working. This seems to be a stimulating intellectual environment. There are a number of high quality publications. EU funding was obtained.

Research environment

The group consists of 1 professor, 1 associate professor and 4 researchers. It is a group with shared intellectual activities, based around a philosophy core, having a good style of working. Largest part of funding comes from external sources, but a substantial part of funding is derived from teaching and consulting. The group's involvement with the county council and the joint position of Hansson should be noted since it is impressive that a non health care person has been able to attract funding and interest in collaboration from the county council. The Centre's development largely depends on external funding.

Networks and collaborations

The unit works in close collaboration with clinical departments in Uppsala and the bioethics group active at the Karolinska Institute. The Karolinska Ethics Group is more medically oriented. Thus, these groups complement one another and the collaboration seems valuable, since there is a need to join forces in a small area. Although the link with the Swedish University of Agricultural Sciences is interesting, it is uncertain whether the focus on animal studies contributes to the consistency of the unit's programme. There is ongoing networking with other European centres, although there are few international joint publications so far. Overall the collaborations seem to be relevant and fruitful.

Opportunities

While there are some strategic plans, such as focussing on biobanks, the research questions are mainly driven from individual researchers as well as from persons coming for consultancies. Neuro-ethics and research governance constitute areas certainly worth pursuing.

26.3.2 Caring sciences

General assessment

The unit of caring sciences constitutes a large and diverse group of people covering areas such as behavioural medicine, caring sciences, nursing research, psychosocial genetics, psychosocial oncology and sexual and reproductive health. Three professors, 5 associate professors and 3 senior lecturers are involved. Some of these groups have aspects of work in common.

The obvious strength in the overall group is performing research on cohorts, longitudinal studies and RCT's. In addition, there were links to clinical practice, with questions arising from practice. The panel's general impression was that the group would benefit from an overall strategy developing a shared conceptual framework, stimulating separate groups to 'work together', organizing quality impetus by peer review, exchange of methodological issues, and improving international cooperation.

Quality of research

Based on the substantial list of publications alone, the quality of the research appears to be overall of internationally recognized standard, although there is variation between the different subgroups. Among the topic addressed the panel was impressed by the work on diabetes and sexual health. There was evidence of diverse and substantial external research funding.

Research environment and infrastructure

It was not evident to the panel that working on common themes among the different groups was maximized. This diversity was represented not only in the number of groups but also in seeing staff directly related to public health and caring sciences as well as staff located in the department of medicine. The group seemed to be directed by individually selected topics rather than a cohesive programme of research. The groups' plans for the next 5-10 years often felt like 'more of the same elsewhere' rather than building an innovative research line based on past and present strengths. Only the behavioural medicine group appeared to have a strong theoretical foundation. The panel, thus, perceived a lack of focus as opposed to a clear strategic vision of what is distinct and sets this department apart from others doing similar work.

The infrastructure was not apparent to the panel. It was difficult to identify an overall perspective on the way of working. Research streams seem to be built up around (professorial) positions and programmes of research seem to

be based on personal interest and funds available. A programme to systematically enhance research quality was not visible at the panel's visit.

Networks and collaborations

International collaboration appears to be opportunistic rather than strategic. A main interest seems to lie in Developing countries. This may indicate that the collaboration does not include leading research groups outside of Sweden. The group could benefit from a strategic approach that includes visiting professors, and post doctoral studies in other countries.

Opportunities for renewal and emerging science

Groups are too small and do not have a strong infrastructure. Some groups could be clustered more strategically, thus building depth as well as breadth. A firm theoretical basis, as found in behavioural medicine, might enhance the quality in the different subgroups and bring more unity in the group at large. Also, building on common research themes could enhance consistency among the different researchers. Thus, one programme could benefit from the knowledge and the expertise of others and the research questions addressed could gain depth.

Other issues

The group has a large number of PhD students. This is to be commended. However, concerns were also raised. because of the desire to keep students on completion, instead of encouraging overseas post-doctoral experience and the recruitment 'new blood'.

26.3.3 Disability research

General assessment

The disability research unit is a small group, consisting of three people, and an additional person associated with a University wide disability centre. The professorship funded by the County council was established only within the last two years. The relationship with the county council might be viewed as strength.

Quality of Research

The research programme has three strands: psychometric measurement, living conditions of people with intellectual disabilities and the occurrence of mental health problems in people with intellectual disabilities. Research funding is very modest and cannot support a long term programme of work. The overall quality judgement based on publications, funding and collaborative strength is acceptable although many publications are of an internationally recognized standard.

Research environment and infrastructure

The research group collaborates with the Department of Neuroscience, Psychiatry at Uppsala University and other Swedish based connections. This group works in close cooperation with the Centre for Disability Research.

Networks and collaborations

We formed the impression that the role of the University wide Disability Centre was not clearly defined in relation to the research group. The group acknowledged that this was also confusing for people external to the University. There seemed to be little integration or cross group working in Disability research despite the fact that people with intellectual disabilities could be seen as a disadvantaged group. The panel did not see evidence that the group is touch with the international centres of excellence.

Opportunities for Renewal

The group's future plans are to focus on evaluation of health and social care provision for people with intellectual disabilities. Given that people with intellectual disabilities are more likely to experience mental illness, a distinctive area of work might be to focus exclusively on dual diagnosis and service provision.

Actions for successful development

Active searching for opportunities for international collaboration would certainly enhance the quality of the work of the Disability Unit.

Other Issues

There is a need to consider, in the context of overall research management within the department, where best the Disability group could make a contribution. On its own, the mass of the unit is small.

26.3.4 Family Medicine and clinical epidemiology

General assessment

The Department of Family Medicine's research focus is on cardiovascular diseases, musculoskeletal disease, social insurance outcome (sick-listing, disability pension) and to some extent on asthma and allergy. This research profile and the questions being asked are of relevance for family medicine but seem to be based on individual interest rather than on a clear research strategy. While family medicine has an important mission in taking up clinical questions arising in primary care, and helping R&D at community level, thus giving good training to family practitioners and the primary care services, there is a risk that this approach disfavours strategic long term planning. One example of this is that many GPs obtaining PhDs do not continue research career but go back to clinical work. The group leader has strong experience in clinical epidemiol-

ogy and follow up of population based cohorts. While some work is still done on the classical Gothenburg cohorts, the different new patient cohorts form the basis for various types of clinical epidemiological research. Many of these are highly relevant and valuable, but there seems to be a lack of strategic vision or overall framework from which the research is organised. Potential synergies do not seem to be developed and implemented. As a result research lines seem to have little in common and it is unclear to what extent there is exchange and stimulation across these lines.

The outreach towards the surrounding community (municipality and Uppsala County Council) seems to be hampered by either organisational, economical or 'political' obstacles. There seems to be more collaboration and some formalized research and teaching collaboration with other county councils.

An important basis for the unit lies in its large teaching commitment.

Quality of research

There is a good publication record in excellent journals as well as in journals with a rather low impact factor. The unit attracts few grants from competitive as well as from commissioned research funds. There is a good variety of important clinical research questions, but there is a certain lack of focus and strategic planning for the future. The overall quality is therefore internationally recognized.

Research environment and infrastructure

The group is characterized by the important role of a single professor and the presence of many doctoral students. Doctoral students were mainly physicians who seemed to return to clinical work after training, and little support was seen for continued research. Three senior lecturers were listed but their position and role was not clarified.

Internal quality control mechanisms were not presented but seemed necessarily weak given that one senior researcher is responsible for scientific leadership.

Networks and collaborations

Networks in the Uppsala Örebro region are fruitful for the Family medicine group. At the same time there is little collaboration with the local county council. International collaborations seem to be limited. Seminar activities seem to be adequate.

Opportunities for renewal and emerging science and actions for successful development

The traditional interest in clinical medicine is increasingly devolved to the community. The group should therefore have an important potential in strengthening the research based on community based services in Uppsala

County Council. The distribution of ALF funding is a strong incentive for the link between research and practice in the Swedish medical research structure, and the panel was surprised that these sources seemed to be very much linked to hospital services.

Building a network of academically interested primary care physicians that can serve as a basis for research will be useful for not only the family medicine groups but also the department and the faculty at large. Similarly, seeking links between family medicine and behavioural sciences would be of interest. Thus, a broader approach to the community and public health issues might be pursued.

Other issues

The leading professor plays a dominant role in the management of the group. This is a risk. Given that he is to retire shortly, a succession plan is needed to assure the continuation and the strategic development of the group.

26.3.5 Health Services Research

General assessment

This is a small group of researchers that wished to remain on their own after the previous professor has retired and no succession was allowed for by the faculty. The group consists of 20 members, directed by two senior researchers who are both externally funded. They realise that their situation is vulnerable, but are satisfied with their way of working as a team and that there is interest from others to work with them. Hence they have so far not felt the need of merging with other units.

The group addresses several interesting research questions regarding the organization of care, clinically oriented health services research, attitudes to health services provision and aspects of organ donation: representing a diverse portfolio of activities with no obvious connecting theme. There is no clear strategic focus. There is, however, also overlap with other areas in the department. The teaching load was perceived to be high, with limited revenue gained from meeting this demand.

Quality of research

This group was clearly perceived to be expert in the field of qualitative methods. They are providing consultations on these particular methods. There are also some international links in this area. The group is productive in terms of papers and theses. However, these are not published in leading journals. The level of funding obtained is reasonable. The research quality is therefore considered acceptable and in some areas internationally recognized.

Research environment and infrastructure

The fact that the previous professor in this team was not replaced, was noted by team members as a particular problem and a disappointment. They spoke highly of the value placed on internal meetings, such as seminars and journal clubs, which were open to the department. Their shared interest in qualitative research methods was seen as important. The group reported on a clear structure to advance their research quality.

Networks and collaborations

The group gave a clear description of internal and national collaboration. International links were mentioned but did not yet result in common projects or publications.

Opportunities for renewal and emerging science

Renewal strategy would be to focus research topics and to support with their expertise in qualitative methods in other groups in order to build and develop this as a distinct area of research. This might also result in international recognition for the group.

Other issues

The groups' leaders expressed a sense that their field was attractive to PhD students. At the same time, concerns were highlighted about the 'safety and ease' of retaining graduates rather than attracting external senior researchers.

While a highly motivated group, this team was rather isolated. Such a position is not sustainable in the long run. As the topic of the research is relevant to the overall mission of the department of Public Health and Caring Sciences, it would be a pity not to further integrate these activities into the other fields.

26.3.6 Social medicine

General assessment

This group addresses important areas such as bio-psychosocial aspects of health and disease, stress related disorders and avoidable mortality. The group has a dynamic leadership with a good capacity to attract funding from the social insurance administration, county councils as well as private sources. There is collaboration with research units in Sweden and in the United States. At the same time, this group does not seem to be working in a quite coherent fashion. It is rather a small group, encompassing further units. Health services research, that normally would form part of social medicine, is yet another group.

Quality of research

The group has generated impressive research in the fields of stress medicine, evaluations of organizational intervention programmes and avoidable mortal-

ity. Some of the publications are in highly ranked journals whereas others are in Scandinavian journals with low impact factors. The contribution in some of the areas that the group lists, such as prevention and inequalities in health, is minor compared to other groups in Scandinavia and Europe. It seems as if the group would benefit from focussing on a few areas in which it has front line strength and expertise. The research quality is internationally recognized with some high quality papers.

Research environment

There is a dynamic professor who made a good presentation but it is somewhat unclear how the group relates to the departments' overall work. Some of the research overlaps with family medicine as well as occupational medicine and health services research.

It was somewhat difficult to get a clear view on the structure of the group, since the department overall seems to be built on many loosely organized groups, and the fact that there is further subdivision within the groups. This is the case also for social medicine. While being small, it has a classical and adequate mix of one professor, one associate professor, researchers and PhD students.

Network and collaborations

As above, the group has good collaboration with county councils, social insurance and private industry. For being a group of social medicine, the lack of contact with local community and the public health work of the county council and the municipality of Uppsala is striking. The hospital based clinical work unit is interesting since it provides a link to stress medicine research. Still, one would expect that the collaboration with the county council would also embrace public health, health services research, health economics and other areas. Although networking is mentioned within Europe and with the United States, international collaboration was not apparent from their publications.

Opportunities

The group benefits from concentrating on front line areas, such as the effect of organizational structure on health, and bio-psychosocial aspects of health and disease. For other areas, such as inequality in health and sickness absence research, there is a need to consider what other groups are doing in Sweden are doing and to think strategically what the group should focus on. Similarly, the group might enhance possibilities for collaboration and joint research.

26.3.7 Uppsala Clinical Research Center

General assessment

The Uppsala Clinical Research Center (UCR) is a centre in which Uppsala University and the Academic Hospital cooperate. The centre has been able to

attract substantial funding and is, as a result, largely independent. Its aim is to provide a service in clinical research and trials, quality monitoring and development, data management, biostatistics and epidemiology. Finally, it aims to develop IT technology for trial management and quality registries and improved methods for clinical research. There are around 50 employees embedded in a clear organisational structure.

Quality of research

In the UCR priorities seem to be driven by strategic questions rather than 'where the money is'. Paradoxically, it can attract good funds and displays a sound financial situation. The centre has a very strong publication record. The level of external funding is also excellent. One of the unusual strengths of this centre is that it is able to provide good consultation in classical but conventional clinical trials, while at the same time building capacity to perform innovative and excellent science. The quality of the research as far as it comes to use of national patient data bases and clinical epidemiological research is considered world leading. This is certainly a 'golden nugget' for Uppsala University.

Research environment

The panel was impressed by UCR's leadership with a clear view on aims and strategy. The group displayed a sense of good internal collaboration and joint action. Also, a good interface with clinical researchers was suggested. This is likely to be a supportive environment for research.

Network and collaborations

The UCR has extensive networks and good expertise in clinical trials and register based research. Its involvement in local clinical research and translational research is impressive. Also, there are good links with the County council and pharmaceutical industry. Finally, there are good collaborations with other strong research departments in the world.

Opportunities for renewal

The centre seems to be oriented towards classical clinical research. If it addressed public health issues, one would expect very important research would result. Also, given the increasing relevance of patient reported outcomes, the centre might attract expertise in behavioural sciences.

Other issues

The UCR displayed a good capacity in biostatistics and epidemiology that the Public Health department is lacking. Yet, it is questionable whether formalizing the link between the two groups would be in the interest of both. The panel wondered to what extent UCR's unique position in the faculty resulted from their wish to be an independent unit.

There certainly needs to be a balance between being a consultancy body on the one hand and to be a strong research institute on the same level as other departments of the university.

Finally, the planning of the succession of the Centre's leading person may become a problem within some years. Therefore, developing a strategy may already be wise.

26.3.8 Centre for E-Health

General assessment

The University of Uppsala's Centre for E-Health consists of a small group of researchers devoted to biomedical informatics and engineering. Research is focused on advanced information-processing methodology. Four FTE personnel are attached to the unit. Neither full nor promoted professors are involved in the Centre. The presentation of people from the unit displays enthusiasm and motivation. The contributors are motivated to work for better science as well as societal relevance. The research areas presented represent a rather broad arena.

Quality of research

The research from the E-health centre is in its infancy. The number of papers is limited. This is understandable given the quite limited size of the group. The current research quality is acceptable but the group certainly has great potential.

Research environment

The panel has extensively discussed what, for the centre for E-health, would be a critical mass. The centre lacks the support of a full professorial position.

Network and collaborations

The centre for E-health has good international research collaboration.

Opportunities for renewal

The centre would probably benefit from more input from clinical medicine. Ideally, a strong, well positioned group of interested clinical persons would help to design the centre. Collaboration with health economists might be fruitful for the centre.

Other issues

The centre for E-Health could contribute a cost effective solution to information management in health care although it is also the case that a National centre might have a better chance of success in this competitive field. The area addressed is likely to become increasingly important over the next decade. The centre is doing interesting and relevant work. It lacks, though, the critical mass

necessary to really live up to what one would expect from this area. Therefore, the panel suggests that despite the risks, this is an area for investment and development to meet future aspirations.

Given the expected growing role and recognition of IT and the subject of E-health, the panel would suggest that an integrated IT policy within the faculty as well as the university could be helpful in placing information technology in general and the unit specifically where it should stand. Also, one might consider whether putting the centre under the Department of Public Health and Caring Sciences would be advisable. This would even be more the case if that department would be strengthened by a methodological unit and health economic expertise as suggested above. The centre itself could certainly contribute to that department.

26.3.9 Occupational and environmental medicine

General assessment

The Department of Occupational and Environmental Medicine is well established. Two years ago, a new professor was appointed who brought with her staff and external funding, thus increasing significantly the size and output of the department. They address important public health issues related to working life, environmental hazards and sickness absence. There is impressive external funding. A substantial part of the staff is partly or completely employed by the County council, thus assuring a valuable clinical connection to their work.

Quality of research

The department addresses important public health and work related issues, and has a good publication record in well known peer reviewed journals. The quality of the research is of internationally recognized, and in some areas, of high standard.

Research environment and infrastructure

There is a good mix of one professor, two associate professors, and several persons with PhD working for the County council. 10-15 doctoral students are listed. There seems to be two major areas, one in occupational medicine, with a focus on sickness absence and rehabilitation, and the other in environmental medicine, with focus on allergy and indoor environment. Two theses have been defended already this year and two in the last year. There is extensive external funding, with a major grant from the insurance agency AFA (8 million SEK). Another major grant (2,8 million SEK) concerns healthy sustainable building. Additional funding is obtained from various competitive funding agencies.

Network and collaboration

The presentation from this group did not enable the panel to make a thorough assessment of the internal department structure and collaboration. External collaboration is mainly with the Karolinska institute and other Swedish players in the field. We could not discern any major international collaboration.

There has been collaboration with the National Institute of Working Life. After the recent closure of that institution, several researchers, including one professor, has been recruited to the department, which should considerably add to the strength of the group.

Opportunities for renewal

Research in sickness absence is ongoing in many units in Uppsala as well as elsewhere and there seems to be a potential for increased collaboration. Valuable research on work environment and the role of organizations is performed at social medicine, and some of these studies might be interesting to link to occupational medicine. The closure of the National Institute of Working Life is a challenge to universities to make sure that valuable research can continue elsewhere. Hopefully the new professor and perhaps other collaborators from the institute can be harboured fruitfully at the department.

Finally, the current mechanism for organisation of research groups could be wasteful of resources. This group might benefit from being reallocated in the faculty's structure. The research from within the department of occupational sciences shows considerable overlap with work within the department of social medicine.

26.3.10 Physiotherapy

General assessment

The physiotherapy research group involves 1 professor, 3 senior lecturers, and 8 lecturers. The group has a heavy teaching load. The focus in this group seems unclear at first but turns out to be related, across disease sites, to the mechanisms behind physical activity and behavioural interventions stimulating such activity.

Quality of research

The different physiotherapists working in this group are located in different departments of the hospital.

Many of the projects are small clinical trials with limited power or single case studies. Many patients pass through rehabilitation projects so there is no lack of research subjects. Maybe because of lack of coordination of services and too strong dependence on the hospital environment, the group has not been able to set up studies with more appropriate sample sizes.

Research environment

The different physiotherapists working in this group are located in different departments of the hospital.

Many of the projects are small clinical trials with limited power or single case studies. It is generally accepted that it is difficult to work with larger research sample sizes given the diverse population that these physiotherapists work with.

Network and collaborations

This group is networking with other groups in Sweden and to some extent with other countries, notably the USA.

Opportunities for renewal

Small sample sizes encountered in this research environment are, among others, due to the fact that patients, nowadays, are referred more early to primary care. The panel therefore suggests that broader collaboration with services in the county council, with other Swedish groups as well internationally should be considered. Also, increased collaboration with groups at the Department of public health and caring sciences (family medicine, occupational medicine) could be helpful.

Other issues

Though good work is performed, the group is organisationally brought under the umbrella of neurosciences which is quite far from their research interest. As physiotherapists are working in different departments, one wonders if re-allocation would allow for better cooperation and advanced research methods. Something might be gained from considering realigning this group under the heading of caring sciences.

26.4 Summary and general conclusions

Panel 21's evaluation activity was devoted mainly to the Department of Public Health and Caring Sciences and, also to independent units, the Uppsala Clinical Research Centre and the Centre for E-Health as well as the Department of Occupational Medicine and the Physiotherapy group from the Department of Neurosciences were visited. The panel's focus was consistently related to 1) the research questions and focus, 2) collaborations held, 3) quality management, 4) scientific methods used and the methodological strengths or deficiencies, 5) how people were working within the groups and the way leadership takes place, 6) level of external funding, 7) longer term perspectives and priorities, and 8) the research societal embedding and relevance. The panel felt being welcomed and addressed in an open and constructive manner.

As regards *the Department of Public Health and Caring Sciences*, the research focus could probably be summarized as preventive and behavioural medicine. This is an area of enormous societal interest, growing recognition and a large scientific as well as applied potential. The department has a number of strengths. First, large data bases are available on a national level, longitudinal studies have been organised and a number of randomised intervention studies have been performed. Secondly, the panel found the number of doctoral students working within the department impressive. The different research groups were found to have varying quality. Some were of high international standard; others are doing good or acceptable work.

The panel formulated a number of issues likely to contribute to further quality improvement and renewal in the department.

1. Different groups working in the department were found to be working on similar themes: quite some overlap was seen. The panel perceived a lack of conceptual framework and strategic planning. Opportunities to exploit potential synergies between and within research groups could be sought.
2. Within the different groups some mechanisms were seen to improve exchange and further quality. At a department level such endeavours seem limited. Therefore, the panel suggests a) that incentives are established to stimulate collaboration with other groups in Uppsala and Sweden or internationally; b) that a quality management strategy improving the overall level of research is developed; c) that a methodological core is organised within the department. This core would support methodological and statistical expertise as well as qualitative methodology. Also, knowledge concerning health economics could become available for the groups involved.
3. While preventive and behavioural medicine are already of uttermost importance, some elements thereof will probably become increasingly interesting in the future: immigration and integration, sexual health, ageing and unemployment are likely to draw attention in the coming years. These areas might gain from being prioritized.
4. In the light of these societal problems and given that different groups have given different accounts of their relation with policy makers, the relation of the department's work within the political arena could be addressed as an important point.
5. The panel had the impression that the way the department is organised may not stimulate change, especially not when difficult decisions have to be made. It would strongly support appointing a research director who will take a lead in the development of an overall strategy, a quality management programme and synergy among the different groups to enhance the focus and the quality of the work done.

As regards the *specific units within the Department of Public health and Caring Sciences* several observations were made.

The *Centre of Bioethics* is seen as a high quality unit given the importance of the subject, the excellent work done in the group and the stimulating manner in which the group seems to be working.

The *Unit of Caring Sciences* is a large and diverse group covering areas such as behavioural medicine, caring sciences, nursing research, psychosocial genetics, psychosocial oncology and sexual and reproductive health. It has a substantial publication list and external research funding. Still, it could benefit from a shared strategic vision, a more firm theoretical and methodological basis, and from systematic planning of internal as well as external collaboration.

The *Disability Research unit* is a group with quite a number of good publications. Still, funding is limited and active searching for opportunities for (international) collaboration and where best the group could make a contribution is crucial. On its own, the mass of the unit is small.

The *Department of Family Medicine* has an important mission given the increasing relevance of primary care. Current research is highly relevant. Still, a strategic vision and the outreach towards the surrounding community could be strengthened. Also, quality management was considered limited. Building a network of academically interested primary care physicians will be useful for family medicine as well as the faculty at large. Similarly, seeking links with behavioural sciences is of interest.

Health Services Research is a small research group addressing interesting research questions. This group was perceived to be expert in qualitative methods. The group is productive in terms of papers and theses. While highly motivated group, this team is rather isolated and integration with activities elsewhere is advisable.

The *Social medicine* group addresses important areas, has a dynamic leadership, and good capacity to attract external funding. The contribution to areas such as stress and organisational change is impressive. Their contribution prevention and inequalities in health is minor compared to other groups in Scandinavia and Europe. The group could benefit from focussing on a few areas in which it has front line strength. Similarly, it might enhance possibilities for collaboration and joint research.

As regards the other units visited, some conclusions were drawn likewise.

The *Uppsala Clinical Research Center* was seen as one of the faculty's 'golden nuggets'. The centre has a strong publication record, its level of external funding is excellent, it provides good consultation and, at the same time, is able to perform excellent science. Given the increasing relevance of patient reported outcomes, the centre might attract expertise in behavioural sciences.

The University of Uppsala's *Centre for E-Health* consists of a small group of researchers devoted to biomedical informatics and engineering. The area addressed is likely to become increasingly important. The Centre could contribute to cost effective management in health care. The research from the E-health Centre is in its infancy though good collaborations exist. Therefore, the panel suggests that this is an area for investment and development. It is im-

portant to develop a faculty- and even university-wide strategy for information technology.

The *Department of Occupational and Environmental Medicine* is well established. It addresses important public health issues related to working life, environmental hazards and sickness absence. The quality of the work is of internationally recognized, and in some areas, of high standard. This group might benefit from being reallocated in the faculty's structure.

The *Physiotherapy Research* is related to the explanation and behavioural mechanisms behind physical activity. This group was able to perform solid scientific work in an area that lacks scientific tradition. The panel strongly suggests that international collaboration in these area could be fruitful. Also, reallocation would allow for better cooperation and advanced research methods.

Some *aspects of general importance* were addressed in the exit interview with the Vice Rector.

1. The panel was surprised that the subjects it addressed, did not appear in the faculty priority list as mentioned by the Vice Rector even though they are mentioned in Uppsala University's profile. The Vice Rector assured the panel that public health and caring sciences are areas of great interest that need to be actively supported. If so, this needs to be recognized officially and shared by the administration.
2. The panel noticed considerable differences in the units' relationships with the county council in the groups visited. The Vice Rector agreed that these relationships are sensitive and complicated and that there is room for improvement. Furthermore, it was unclear how the ALF resources were distributed. They seem, in Uppsala, to be mainly oriented towards hospital based activities.
3. The panel discussed the Faculty's funding model that implies that groups are dependent, among others, on the impact of journals in which papers are published. This system is unjust and not motivating for certain areas and indeed under discussion. The panel suggests that a new approach is essential to the field of public health and caring sciences.
4. For renewal, the panel has suggested that to be competitive at the faculty level, in clinical and behavioural medicine, it is necessary a) to invest in a methodological core at the Department of Public Health and Caring Sciences, possibly in conjunction with the Uppsala Clinical Research Center; and b) to develop an overall IT strategy including the Centre for E-health.

27. Panel 22

27.1 Introduction

The panel very much appreciated the honour to be asked to carry out this task. We were in no doubt that the Vice-Chancellor's hope for the identification of "Golden Nuggets" is fulfilled in several areas of medical research - we identify these below in **bold**.

But when we arrived in Uppsala, we were faced with a succession of many presentations, which left rather little time for discussion and, perhaps more importantly, for informal discussion with PhD students.

This somewhat ad hoc and unbalanced programme turned out to be a symptom of one of the major problems in the organisation of Medicine in Uppsala - namely that (perhaps largely because of self-funding arrangements) the titular department head in some cases had no real supervisory control over these disparate groups, all of which seemed to require a hearing by the panel. Furthermore, we found some very curious groupings within departments - particularly Oncology, Immunology, Radiology and Biomedical Radiation Sciences (ORKI). Our discussions suggest that the future home for clinical immunology might be reconsidered.

Fortunately, the age structure in several groups is such that within a few years it should be possible to arrange some more rational groupings, with better integration and more viable size.

It also seemed that there should be some thought given to grouping several teams together under an overall leaderhead perhaps as a "virtual Institute with a common letter - this could also result in more viably sized and more "visible" units, and save duplication of core facilities. Several people mentioned the importance of such rationalisation of expensive facilities, together with a pressing need for a dedicated block of research beds.

Financing of all groups was complex - as is common everywhere.

University core funding has all but disappeared, and funding comes from many sources. For University funding most of us thought this was a largely transparent exercise. One area where funding could be more transparent is the ALF money provided by the county, the owner of the hospital and included in the hospital budget. This money for research funded many of the MD students studying for a PhD. We were informed that PhD students generally receive a 3-month salary per year for research (ALF money). Unfortunately this research period was often split into shorter periods, and moreover was then interrupted by clinical and teaching obligations. This system often prolongs

the time to PhD examination. We recommend that when needed (and feasible) this research period could be extended to a minimum of six months per year - preferably as continuous periods of at least 1 month of 100% time in research. We suggest that the Faculty seriously consider how it can best address these issues.

We appreciated the effort to supply comparative statistical data for the last 2 five-year periods. From these data it appears - in general - when comparing the later with the earlier period:

1. The number of PhD students has increased substantially, whereas the staff (all grades) has remained static
2. The average age of the PhD students was high (surprising to us at around 40 yrs) and again was unchanged over 10 yrs. Gender ratio overall remained unchanged
3. The net research time per student was around 2 yrs full-time equivalent (spread over 5+ years - including course work), but a wide range existed.
4. The number of published articles had declined - but possibly there is more course work now??

This does not seem an ideal situation.

The local community leaders should also consider the very great benefits accruing to Uppsala from the presence of a high class research-oriented hospital. But this also carries a responsibility for the community to support this research - as a matter of enlightened self-interest. We were repeatedly told of the erosion of research time as a result of the (understandable) desire of the hospital for more and more clinical activity for the same funding. This is a short-term gain with a serious long-term risk to the education and training of junior doctors - a matter of some importance to the community, not least in the development and application of the latest treatments.

One undesirable solution (if more money cannot be put into the programme) is to limit the number of students, but insist on a proper PhD programme which, at the end, produces people with the necessary potential and training for independent research. It cannot be said that the present system produces this result.

We also noticed that the threshold for PhD examination in Sweden is lower than in most other countries (in Sweden it seems that only two publications accepted in peer reviewed journals are mandatory). Additional manuscripts presented at the examination may actually never be accepted for publication.

There were notable exceptions to these generalisations in those departments which we identify below as of high international standing.

For ease of identification we have reported our impressions in the order of the interview timetable

We were very well served by our 2 “minders” Anita Ericson and Boel Åström. The hospitality shown to us cemented the team - who had been well-chosen to cover the science.

Finally, we were all highly impressed with what we saw - a very fine hospital facility, with enthusiastic and high class researchers

27.2 Department of Women's and Children's Health

27.2.1 General

This department is headed by Prof Ove Axelsson, but in reality is composed of many separate groups, which seem to have "landed" there by a mixture of history and chance.

Some of the clearly exciting areas such as Paediatric Inflammation might be better located in a more general department with common interests, and the likelihood of shared core facilities. We were impressed by only a few of the presentations, when compared with international standards. In terms of publications it has to be said that these were not in high impact journals - possibly because several of the more promising groups were relatively young.

On the other hand the department has many professors nearing retirement, so there will soon be opportunities for reorganisation and regrouping which could be of future benefit to the University and Medical Sciences.

27.2.2 International Maternal Health 1-2/4

We were impressed with the work, important international collaboration, clear enthusiasm, and vision of **Assoc. Prof Elisabeth Darj**. This seemed to us a very promising and important area for future expansion. Please see our comments on "International Child Health".

Similarly, with the recent coming together of the 3 relatively young people in **paediatric endocrinology 2/4**, and also the group of workers within the broad category of **paediatric inflammation 2/4**, there might be an opportunity here for growth - preferably in collaboration with other workers outside of paediatrics (e.g. with clinical immunology, or the department of medical sciences - vide infra).

27.2.3 Paediatric neurology 3/4

This group had no academic positions. The senior staff were all nearing retirement, and are busy clinicians - so there may be some needed refocus in future.

27.2.4 Paediatric oncology 3/4

A main strength is the tissue biobank of 1000 samples from tumours (but this facility in the future need not necessarily be located in Uppsala??). Malignancies in children are quite rare and therefore paediatric oncology should/might

be centralised in Sweden, either to Uppsala or to some other university, in order to guarantee adequate numbers of patients both for clinical treatment and research.

There was also a dependence on collaborations with the departments of Molecular medicine and Clinical Pharmacology - if these were to change emphases, how would paediatric oncology fare?

27.2.5 Men's Violence against women 2-3/4

This is a most important social problem. The unit has just recently become a new University Group with a focused leader, but we still have to wait for scientific reports.

27.2.6 Neonatology 3/4

This had had a successful past in research on initiation of breathing and paediatric lung injury. However it seemed to us to be now rather unproductive and unfocused. Again, the department has older department heads, and gives the University some opportunity for refocus/change in the research field in the near future.

27.2.7 Clinical and experimental reproductive biology: 3/4

This was a diffuse and somewhat disorganised collection of research interests, but there is good potential for future collaborative work with others.

27.2.8 **International Child Health 1-2/4**

This was presented by an enthusiastic and experienced leader, with **a good opportunity for future expansion**. There were several well focused international projects in Bangladesh, Vietnam, and Nicaragua. The group was young, and had excellent international networks already established. As **in International Maternal Health** (see above), there was an important training programme of overseas researchers, who after completion of their theses returned home to their native countries. The close collaboration of these two groups seems natural and desirable.

27.2.9 Gynaecological Endocrinology 3/4

This appeared to be very much a 'one man department' with lots of separate projects but apparently no main collaborations within similar sections in Uppsala.

27.3 Department of Oncology, Radiology and Clinical Immunology

The panel found it difficult to understand the rationale for the disparate groups within this broad envelope. However that is not to deny the **quality of some of the constituent parts**. There were clearly great strengths in **imaging - MRI and PET**. There was a first class training program with almost full-time research opportunities for PhD students.

We could not understand the logic of the sale of the university owned powerful PET centre to General Electric Healthcare (Reconsider this??). This seemed to have had the result that the undoubtedly innovative tracer program (for both diagnosis and potential therapy) mainly benefited industry rather than the University. (It also hindered free access by this talented group??). In spite of this the PET and MRI users in Uppsala were obviously happy with the excellent services provided.

27.3.1 Clinical Immunology 1*/4

This is undoubtedly one of the valuable **nuggets for future development**, with a focused Head of Department, and world class and highly capable researchers - who had succeeded in attracting a large amount of research support in a highly competitive field. It is apparent that Ole Korsgren and his colleagues are among the world leaders in the area of pancreatic islet cell transplantation. It seems likely that the present rate of rapid growth will continue. Again - unlike the more clinical departments) there was an excellent PhD training programme with full time for research, which is facilitated by impressive external funding. It is not surprising that this group has far more applicants for PhD students than they are able to accept. This situation will apparently be solved if the plans for a new larger building are realised.

27.3.2 Oncology 1-2/4

This was a well led department; which covered the whole range of tumour biology, pathology and treatment. The excellent track record of **Bengt Glimelius** - with a vast number of randomised controlled studies, particularly in colorectal cancer - is well recognised, and the research activity is continuing strongly (see below. The breast cancer group is solid, but the future activity seems hampered by the fact that the leader is working only part-time in Uppsala. The lymphoma group has a fairly good production of scientific papers and PhD examinations; they have a good collaboration with national and international groups.

It is also to be noted that the oncology group in collaboration with psychologists and health and care sciences has paid attention to an often forgotten area, i.e. the supportive care of cancer patients In some ways, there was per-

haps an over-ambition programme, covering so many separate fields in cancer research.

27.3.3 **Biomedical Radiation Sciences 1-2/4**

This group (led by Professor Carlsson) was clearly an **effective department of high International standing**. They have developed effective methods of labelling and targeting of tumour cells, as well as a very promising industrial collaboration with expertise in novel labelling techniques.

27.4 Department of Surgical Sciences

The programme of the 13 units was introduced by the Chair Prof Lars Wiklund. We were impressed by the **high quality** of many of the research programmes.

27.4.1 **Endocrinological Surgery 1*/4**

High quality international translational research of long tradition. The three research lines on parathyroid, phaeochromocytoma and midgut carcinoids are well focused. In future the faculty might **consider regrouping with the other endocrine groups**.

27.4.2 Forensic Medicine 3/4

A small new department with **potential**. Is surgery the right home? By international standards it is barely viable. The research activity has been low for many years but now seems to be active and on the right course.

27.4.3 Plastic surgery and burns 3/4

Although there is no current academic plastic surgeon there is an enthusiastic surgeon with academic potential (**Nowinski**).

27.4.4 **Orthopaedics 1*/4**

A young department of **outstanding potential** comprising strong epidemiology (Michaëlsson), and world class work on bone replacement (**Larsson**). They had experienced (surprisingly) academic recruitment problems, but had attracted much outside funding (independent of Industry).

27.4.5 **Gastro-intestinal surgery 1/4**

High class studies on surgery of colorectal cancer combined with modern oncology therapy (Påhlman). Graf has created a good personal research line on large bowel motility and proctology.

We were surprised that upper GI and HBP research were not featured, which also produce good research.

27.4.6 **Vascular surgery 1/4**

Another internationally recognised and excellently focused research programme. The present head (**who has been hugely productive**) has a clear talented successor, but DB will continue to be active.

27.4.7 **Urology 2/4**

Another excellent group focused on bladder cancer (Malmström) and localised prostate cancer (Bill-Axelsson), relating molecular biology of tumours to clinical research.

27.4.8 **Cranio-facial surgery 3-4/4**

A small group, which depended on links with others (Switzerland and Norway). Publications were unimpressive, and there was little funding.

27.4.9 **ENT 2 (Experimental otology) 2-3/4**

This consisted of an enthusiastic, older, but isolated researcher - unimpressive publications. No current links - but clearly would benefit from scientific liaison.

27.4.10 **Anaesthesiology (3), Intensive care (3), Pain therapy (1). 1/4**

A multi-faceted department with prominent research on areas of pain, but nothing about the ICU research was presented. Potential exists in the epidemiology of injury. There were some interesting projects on resuscitation and sudden infant death.

27.4.11 **Cardio-thoracic surgery 4/4**

We were rather concerned by the absence of any serious research effort - in comparison with most of the surgical specialties. We had the feeling that this department is also not in the best position (in Sweden) clinically. There was no evidence of any commitment to research or audit - **needs some attention**.

27.4.12 ENT 1 2-3/4 (Otolaryngology and Head and Neck surgery)

Not highly productive, but more potential than ENT 2. This group have links with PET group for imaging and the radioimmuno-targeting group for diagnosis and therapy of head and neck cancers.

An enthusiastic but isolated researcher - unimpressive publications, but interesting ideas on the treatment of Menière's disease.

No current links - but clearly would benefit from scientific liaison.

27.4.13 Transplant surgery 2/4

Potentially good small department. The research seemed totally dependent on the work of Tufveson, who has concentrated on experimental surgery (perhaps due to the rather limited number of transplant patients). Good scientific collaboration with the nephrologists. Prof Tufveson is nearing retirement - he had a potential junior with promise. Perhaps transplant surgery could join another research (e.g. clinical immunology) or renal medicine.

27.5 Department of Medical Sciences

The Department of Medical Sciences was presented as 25 individual research groups; with a number appearing to duplicate each other's activities. We suggest that this might be viewed as an area for amalgamation of like-minded researchers.

There were 2 related & outstanding groups:

Endocrine oncology 1*/4 has internationally competitive programmes, but there may be opportunity for a more rational **regrouping with others** with similar interests. The group is internationally recognised and performs science of excellent quality.

27.5.1 Endocrine tumour biology 1/4

The endocrine tumour biology group have internationally competitive programmes. It is a spin-off group from Oberg's group, having potential for good research. (again, see above regarding a more rational regrouping with others with similar interests).

27.5.2 Clinical chemistry 2-3/4

A very small group with some good publications - but mainly acts as a servicing lab for other international endocrine groups. It might consider combining with endocrinology, or other departments with similar interests.

27.5.3 Cancer pharmacology/Informatics 2-3/4

A small group with novel approaches to cancer chemotherapy - but hot competition from many industrial groups. Will they compete internationally?

27.5.4 Haematology 3-4/4

A largish group, but with 4 aging seniors. Not too impressive publications. Involved in many good clinical trials.

27.5.5 Inflammation 1/4

An internationally recognised group, with young researchers, and supported with good external funding. **This group could usefully combine with a number of other groups of similar excellence in related areas to create a centre of excellence.** This might also be better for the sharing and future financing of expensive resources.

27.5.6 Auto-immunity/Inflammation 1/4

High class cutting edge research. See above (Inflammation).

27.5.7 Systemic auto-immune diseases 1-2/4

A recently formed research group - attracting substantial funding. **Again an opportunity for “Institute” collaboration.**

27.5.8 Gastro-enterology and Hepatology 3/4

Small in relation to international competitors - Possibly better viability if merged - perhaps with inflammation.

27.5.9 Rheumatology 2-3/4 (because of future)

A **good leader who is retiring**, so future uncertain, with no obvious successor. Disparate research, which is not rheumatology, but good science.

27.5.10 Respiratory Medicine and Allergy 3/4

A disappointing department, with vacancy. Again might merge other groups in similar areas, i.e. Clinical physiology.

27.5.11 Dermatatology and Venereology 2-3/4

Nice ideas for future promise - gene network.

27.5.12 Infectious diseases 2/4

Some collaboration at present. New professor with interesting new lines of research will arrive this year

27.5.13 Clinical bacteriology 3-4/4

Another new head with a problem of location - **Needs to be in main hospital - possibly with infectious diseases?**

27.5.14 Biochemical structure and function 3/4

Too small, unfocussed research, low funding.

27.5.15 Renal medicine 2-3/4

A previously strong department - combine with transplant surgery?

27.5.16 **Molecular medicine 1/4**

A high class group with a strong leader. It combines a large service function in Genomic technology. The University should **consider a future strategy** to make this a core facility as the equipment is highly expensive to keep up with world standards

27.5.17 Pharmacogenetics 2-3/4

Will this group compete internationally? A small unit, which should focus its research and probably merge?

27.5.18 Metabolic bone disease 2/4

Good leader (Ljunggren) who was reluctant to expand/merge.

27.5.19 Osteoporosis 2/4

Epidemiological work on vitamin A, in collaboration with orthopaedics.

27.5.20 Endocrinology/diabetes/metabolism 1-2/4

Previously strong department - successor needs consideration. **New studies of morbid obesity.**

27.5.21 **Cardiology 1/4**

International class research with many influential clinical trials

27.5.22 Clinical coagulation 1-2/4

New promising **novel work on tissue factor**.

27.5.23 Cardiology/arrhythmia 2-3/4

Competent, but not novel research. Meagre funding

27.5.24 Acute internal medicine 2/4

Presently housed in geriatrics. Might be a **partner in current clinical physiology labs** (see next) - doing surveys using physiological techniques - good publications

27.5.25 Clinical physiology 2/4

Internationally high standard. Good head now retiring - a currently less fashionable field - **labs suitable for new combined use? Historical, but inappropriate, headship of nuclear medicine. Nuclear medicine studies should be conducted in a core imaging centre in radiology.**

27.6 Department of Public Health and Caring Sciences

27.6.1 Clinical Nutrition 1-2/4

This is the only group we saw from Public Health. New department head with promise and societally important issues.

27.7 Conclusions

1. **Uppsala is an outstanding national referral center, but it may be important nationally to try to partition who does what – so that the University focuses on particular research areas rather than try to cover everything. Concentration on a few strengths may be more successful.**
2. **To create excellence, the structure of research groups in Uppsala clinical sciences should be less fragmented. We feel it would be a win-win situation to merge groups within the strong fields of immunology, endocrinology, bone disease, inflammation, infectious disease/bacteriology, and imaging.**
3. **Career counseling of the PhD students and post-docs is needed to identify those with good potential to become top leaders of internationally outstanding research.**

- 4. Money allocation – more resources should be concentrated on internationally outstanding groups.**
- 5. Separate housing for clinical research core facilities and beds would be a priority area to encourage collaboration and cross-fertilization.**
- 6. A larger proportion of the ALF funds should be distributed based on competition – we suggest this fraction to be at least 40-50**
- 7. From the ALF monies, it should be possible to devote more than 25% of the time in hospital to research in the framework of the PhD program.**
- 8. There is a commendable and widespread collaboration with industry.**
- 9. There maybe a future need for a faculty for gene therapy – but this is very expensive and highly competitive field worldwide.**

28. Panel 23

28.1 General assessment of neuroscience at the University of Uppsala

The panel has evaluated neuroscience research in two departments: Geriatrics of the Department of Public Health and all research of the Department of Neuroscience.

28.1.1 Current research

The *Department of Public Health/Geriatrics* focuses on dementia research. The two areas of research are molecular studies of dementia, and clinical and epidemiological studies of neurodegenerative disorders. There is an enthusiastic attitude in the unit which has an obvious potential for breakthroughs in diagnosis and treatment of neurodegenerative disorders. The research is well focused with clear synergies between the different groups of the unit. The research profile of the unit makes a good fit with that of the Department of Neuroscience. A closer coupling to the activities of the Department of Neuroscience is recommended, or the unit could be included as one part of the Department in the future.

The *Department of Neuroscience* was formed in 1998 by fusing 10 basic science and clinical departments plus a neuroanatomy group from the Department of Anatomy. In 2002-2005 the Department of Neuroscience has grown due to the inclusion of a part of the Department of Physiology, and groups working in comparative medicine, logopaedics and genetics, and development. The process of incorporating the previously independent departments in the Department of Neuroscience has created a situation of extreme diversity in this department. This diversity can be seen as a potential strength to create multidisciplinary constellations extending from very basic molecular/cellular studies to clinical research. However, this opportunity has been so far used only to a limited extent, and many small units still live their own isolated life. Positive examples of synergistic, multidisciplinary efforts include research on traumatic brain injury where several groups are joining forces around a common theme. Another example of a collaborative effort, that is being started and should be encouraged, concerns feeding behaviour and obesity.

The following units/research programmes (listed in alphabetical order) are rated to be of high international standard:

- Clinical neurophysiology (Larsson)

- Developmental Genetics (Kullander)
- Geriatrics at the Department of Public Health focusing on dementia research (Lannfelt)
- Neurotrauma research, where several groups (Hillered, Enblad, Ebendal, Aldskogius/Kozlova and Hallböök) have formed a program exploring traumatic brain injury, and neural development and regeneration
- Pharmacology (Larhammar, Shiöth).

28.1.2 Actions for further development

Neuroscience of Uppsala is in urgent need of a strategy that defines a niche in this extremely competitive field. As the department now stands it is too diverse and fragmented to be competitive, as pointed out below in the individual assessments. The Department of Neuroscience and the faculty should see it as an important task to develop an appropriate strategy.

The need for strategic planning is emphasized by the fact that several positions in neuroscience and related areas become open in the very near future. This brings an opportunity for renewal of the research area. Furthermore, the panel identifies a clear need to develop the research infrastructure and to promote common use of expensive equipment and core facility functions of specialized areas, such as phenotype analysis of mouse mutants (e.g. behaviour) and modern imaging. A clear strategy and well articulated visions are obviously needed to catalyze this development.

Focus on a few thematic research areas would provide an excellent platform for a strategy. Several themes in the department are on the verge of becoming highly visible and competitive on the international arena. One such theme is feeding behaviour and related disorders, including the physiology and pathophysiology of the digestive system. In this field, the groups with primary expertise in molecular biology and genetics would profit from collaborating with epidemiologists and with clinically oriented researchers (including psychiatrists) while the physiologists would see an increased impact of their studies if they took advantage of the molecular biology expertise in the Department. By joining forces it is not unrealistic that the Department of Neuroscience could assume a prominent position in Europe in the field of eating disorders and thus get access to resources embedded in the EU 7th framework program. At present the Department of Neuroscience is not involved in any EU projects and it is therefore essential that the Department exploit in full its potential for successful international networking.

Also in other fields one could - with relatively minor efforts - unleash synergies that could improve significantly the quality and impact of the Department's research (see separate evaluations below).

In order to unleash the required synergies the panel feels that there must be appropriate incentives in place. The panel strongly suggests that the Faculty or

Department announce a competitive call for intramural “Thematic Networks” (TN). The applications should describe how networking of different groups within the department and faculty could help promote the quality and impact of the research within a given topic (such as eating disorders, described above). The application should contain a plan for the sharing and flexible use of technology and equipment and for establishing competitive consortia within the EU framework programs. Hosting of international meetings on the topic at hand could be part of the plan. In the first round the money granted to successful applications could be modest but sufficient to cover networking and meetings. A real incentive would arise in the next round, if the Faculty decided to prioritize the TNs when it comes to allocation of future positions.

In summary, a few major TNs of research would offer several advantages to guide further development and renewal: (1) they would create strong interdisciplinary research environments that have realistic possibilities to reach a prominent status in their areas of research, (2) these areas can be taken into account when filling the positions that become open during the next few years, (3) the TNs can be used to guide development of infrastructure, e.g. purchase of common equipment and setting up core facility functions, and (4) high-profile thematic research areas would be an excellent asset to attract talented young scientists and external funding.

Teaching at the Department of Neuroscience is quite unevenly distributed between the groups; some PIs report that they use half or even more of their time for teaching whereas some do not teach much at all. The panel suggests that the Department would reconsider distribution of teaching. The panel has the impression that a strategy where all groups participate in teaching to some extent should be possible in the Department. The strategy where resource allocation to the groups depends on teaching activities should be also reconsidered, and more emphasis should be given to research accomplishments and participation in major thematic research areas.

28.2 Department of Public Health/Geriatics - dementia research

28.2.1 General comments

This is a very active unit with a clear focus of research and well defined visions and strategies. The unit has a rather short history. It was founded in 2001 when the current head - Lars Lannfelt - was recruited from Stockholm to set up an Alzheimer research group at the Department of Public Health. During a relatively short time span Dr Lannfelt has built a group that now has a staff of more than 30 and that is divided in five thematic subgroups - focusing on amyloid biochemistry, transgenic models, genetics, synuclein and Tau, and

clinical research. Thus the activities span from basic research to research on patient cohorts.

The five different groups represent a wide spectrum of technologies providing for a multidisciplinary approach to a better understanding of the mechanisms of Alzheimer's disease - and of amyloid formation specifically. There seems to be a good interaction between the groups and the complementarity in expertise is obvious.

Much of the research is built around the idea that soluble amyloid beta peptides are the main pathogenic species in Alzheimer's disease. To pursue this hypothesis the group has recently been successful in producing a conformation specific monoclonal antibody that recognizes selectively amyloid protofibrils. This antibody may prove to be an important tool and help secure the prominent position of the Lannfelt group in the field of Alzheimer's research. The ultimate aim is to use the new antibody in early diagnosis as well as therapy for Alzheimer's disease.

The Lannfelt group has a close contact with the Geriatric Clinic at the Uppsala University Hospital which allows access to clinical samples. The group carries out genetic analyses of patients with dementia, to better characterize genes that are known to cause disease and to identify new genes.

In the area of clinical research the Lannfelt group is performing longitudinal investigations of patients with Alzheimer's disease and frontotemporal dementia. These investigations are done in collaboration with the Uppsala PET center and take advantage of the amyloid-specific ligands that were recently developed for human studies. The group is also carrying out population based analyses of samples from the Uppsala Longitudinal Study of Adult Men (UL-SAM).

28.2.2 Quality of research

There is no doubt that the research in this unit is of very high international standard. The Lannfelt group has a high visibility at international meetings and has published - and continues to publish - papers with substantial impact in the field. Currently the productivity is not impressive if one takes into account the size of the group. However, this must be seen in conjunction with the fact that significant resources have been invested in establishing new tools and models that will undoubtedly serve to boost the publication activity in the years to come. The new conformation specific antibody (see above) is a case in point, as are the transgenic models that have been pioneered by the Lannfelt group.

28.2.3 Research environment and infrastructure

The research environment appears to be well suited to the activity and aims of the unit. The panel was not able to identify any unmet needs in regard to infrastructure or personnel.

28.2.4 Networks and collaborations

The unit has established an excellent collaborative network with the Geriatric Clinic and the PET center that bodes well for the future research. There is also an ongoing collaboration with the groups of Ulf Lindahl and Ulf Landegren. The general impression is that the group is very well integrated in the local research community. However, the panel saw the potential of establishing stronger collaborative axes with the Department of Neuroscience. In the long run it would also seem logical to discuss the relationship with the latter department in an organizational context.

On the international level, the Lannfelt group is partner in an integrated project of the 6th Framework Programme (APOPIS - Abnormal proteins in the pathogenesis of neurodegenerative disorders). The group has also direct collaborations with a series of leading laboratories in USA and Europe.

28.2.5 Opportunities for renewal and emerging science

The current activities of the unit are future oriented and strong efforts are being made to develop new tools and models from which the group can harvest in the years to come. The structure of the unit and its integration in the local community are well tailored to the long term goals and ambitions. It is therefore the opinion of the panel that the Uppsala University would be well served to keep up its strong support of the Lannfelt group. In all likelihood this group will be able to maintain and consolidate its prominent position in the field of Alzheimer's research.

The panel was impressed by the activities of the young scientists in the group. However, it was not clear how the unit plans to ensure adequate recruitment (internally or externally) for more senior positions. Given the age profile of the group, recruitment at this level should be part of the unit's strategy.

28.2.6 Actions for successful development

It was the impression of the panel that the group has a well defined strategy which holds promise for a further improvement of the group's visibility and international impact. As stated above, it would seem important to identify and exploit possible synergies of a closer interaction with the Department of Neuroscience. It would also seem essential to ensure that the group maintains

its position in EU networks (the current EU 6th FP project Apopis runs out in 2007).

28.3 Department of Neurology

28.3.1 Psychiatry

General comments

The department has three different units. The adult psychiatry unit is located in the general hospital, the child and adolescent psychiatry unit has a different location, and the Ulleråker unit is based in the hospital previously used for patients with chronic and psychotic disorders (this also now includes the disaster psychiatry unit). The number of full time researchers is small compared to many other University departments of psychiatry.

The output measured as the number of papers in well-established international peer-review journals is fairly small and there is relatively little evidence of multi-site and interdisciplinary research (except with the Burns Unit). However, with the limited man power available, 18 PhD theses completed during the period 2001-2006 (8 in adult psychiatry in Akademiska sjukhuset; 7 in Ulleråker and 3 in Child & Adolescent psychiatry) is very good.

The overall impression is that there is strong but unrealized potential within the department of psychiatry and there is a need for a clearer focus on a much smaller number of topics. The potential of collaborations with other departments within the Department of Neuroscience has not been fully exploited. There is also a pool of in-patients and out-patients attending the department that could be of value for research projects of clinical significance.

Quality of research

There is a lot of disparate research. Within the child and adolescent psychiatry unit and that in the general hospital the main focus has been on clinical aspects and the natural history of mood disorders and, more recently in older subjects, on psychiatric aspects of physical injury (particularly burns) as well. There has also been research on treatment and personality influences on outcome (with substantial involvement of the pharmaceutical industry) and on eating disorders, particularly in the child and adolescent unit. Our main concern is that much of this is secondary and not followed through sufficiently, with too much emphasis on explorative and descriptive aspects rather than hypothesis-driven research. The quality of the different research projects within the sections of adult and child and adolescent psychiatry varies from acceptable (adult psychiatry) to internationally recognized (child psychiatry).

At Ulleråker the research focus is partly on schizophrenia and ADHD, linked to studies on disturbances in brain development. The output measured in publications is good, but there seems to be - with one exception (the

schizophrenia group which has internationally recognized research) - little interdisciplinary research. The National Centre for Disaster Psychiatry appears to be independent of the other units despite obvious similarities in research profile with the burn injury studies conducted at the general hospital unit. The output measured in publications from the National Centre of disaster psychiatry is very low and impossible to rate.

Research environment and infrastructure

There is a serious lack of a shared long-term scientific strategy within the unit. This has led to researchers working more or less independently with no common goals or good interaction with other groups that could reinforce the quality of their work and promote integration.

The department is also hampered by lack of young and energetic researchers, which we recognize to be at least partly related to poor working conditions for research-minded clinicians. It is also our impression that the high teaching load and clinical obligations hamper research endeavour and there is a poor infrastructure for promotion in research posts.

With a relatively small number of full-time staff the importance of collaboration and other research attachments is even greater but seminar activities and visiting scientists seem to be low in number. This could be changed with more focused attention to a clear and well-supported research strategy. The composition of the current staff is also biased towards more senior researchers, who despite past high international ratings, are now approaching retirement. New appointments are needed to develop a viable strategy that should plan at least five years ahead.

The different organization of research and clinical departments also hampers research. The clinical department of psychiatry at Akademiska sjukhuset is organized differently and include social medicine and environmental medicine in addition to psychiatry. It might be more productive, from a scientific point of view, if the latter two clinical units were kept separate from psychiatry.

Networks and collaborations

There are some collaborations with other Swedish researchers (in Linköping, Gothenburg, and Umeå). Within burn injury research there is collaboration with centers in the Netherlands, but the overall impression is of a somewhat restricted national and international collaboration. This needs to be rectified.

Opportunities for renewal and emerging science

The Faculty of Medicine has chosen to prioritize psychiatry. This offers opportunities to strengthen the field. The department of psychiatry could benefit greatly from close collaboration with other clinical and pre-clinical departments, e.g. with the dementia group (Lannfelt), the movement disorder unit within neurology (Nyholm), and the genetics and developmental biology

unit (Kullander). In addition, there could be further collaboration with pharmacology (Larhammar, Schiöth), in particular in relation to eating disorders and NPY, and neurogastroenterology (Flemström, Nylander) with reference to the close association between mood and anxiety disorders and functional gastroenterology, but a great deal would depend on the essentials of the overall strategy. As there will be several key research positions available within the department over the next five years, an excellent opportunity exists to develop the department further.

Actions for successful development

1. It may be wise to invite all units within the Department of Neuroscience to an open meeting where candid discussions about how work in the department of psychiatry could lead to research projects of mutual benefit. This could pave the way for development of thematic research projects across the different units within the Department of Neuroscience.
2. It may also be worth trying to recruit younger clinicians from clinical psychiatry, for example by creating half time clinical and research positions (e.g. psychologists, psychiatrists). This could also facilitate collaboration with other clinical departments (1/2 time clinical work there; 1/2 time research).
3. A parallel approach is to recruit more medical students to participate in small time-limited research activities as part of their studies.
4. Participation in international research networks that have relevance to the research strategy of the unit would also be strongly recommended. This could include joining multi-site projects within clinical psychiatry and psychosomatic medicine.
5. All research units within psychiatry should have the same geographical localization. From a research perspective it would be most helpful if psychiatry would be located together with other units within the Department of Neuroscience.
6. Reorganising psychiatric research in three major research lines, i.e. consultation-liaison psychiatry (C-L) / psychosomatic research (eg. psychiatry-psychology in patients with somatic disorders -injury); adult clinical psychiatry (e.g. psychiatric disorders) and child & adolescent psychiatry may offer some advantages and make it easier to develop collaboration with other units within the Department of Neuroscience. The disaster unit should be integrated in such C-L/ psychosomatic research unit. It is also worth reflecting upon the possibility of reallocating rehabilitation medicine to such a C-L / psychosomatic research unit in order to strengthen this area of research.
7. Allocation of one of the vacant senior positions coming up within the next 3-5 years for recruitment of a full-time research professor with competence in more basic neuroscience - and allocate this position

to the unit of psychiatry similar to the neurosurgery model (neurochemistry - neurosurgery) - might be a further option to strengthen psychiatric research. This suggestion is made partly because there is currently a dearth of good clinical academic psychiatry researchers.

28.3.2 Pharmacology and functional pharmacology

General comments

The two units are complementary in the sense that their research programs are aimed at providing a better understanding of the neurotransmitter systems involved in appetite and feeding regulation. The research efforts of the Pharmacology Unit are focused on the neuropeptide Y (NPY) system of peptides and G-protein-coupled receptors (GPCRs) and studies of gene families in vertebrate vision and neuroendocrinology focusing on peptides and peptide receptors. The Functional Pharmacology Unit is focusing on research related to the understanding of neuronal networks regulating food intake and reward, programs concentrating on protein families such as GPCRs and transporters (SLC), that may be suitable for pharmacological targeting.

Both units are functioning well and appear to have an optimal composition of researchers in terms of age and gender. They master a large number of modern methods in molecular pharmacology using genomics, bioinformatics and mapping techniques.

Quality of research

The two units have an impressive research activity reflected in a large number of publications, mostly in internationally well-recognized journals and a high level of citations. The research of the unit is of high international standard.

Research environment and infrastructure

The composition of the research groups differ somewhat from each other in the two groups. One group is headed by a full professor while the other group is currently headed by a senior researcher. Otherwise the groups consist of a mixture of PhD students, graduate students and post-docs.

Networks and collaboration

Both groups have a strong international collaboration network which very likely will provide expertise to secure successful research results.

Opportunities for renewal and emerging science

Both groups work at the forefront of research and they have well worked-out plans for future research activities. There is good reason to assume that this line of research will lead to important findings which will assist in development of new therapeutic strategies for treatment of disorders leading to obesity. This seems important in the light of the increasing problem of obesity in

the Western world. It seems clear that collectively these research groups could become a prominent part in an EU Framework supported consortium coordinating efforts at the basic science and clinical level to explore joint strategies to fight the threatening epidemic of obesity in Europe.

28.3.3 Physiology

General comments

The unit of physiology consists of two small research groups headed by Gunnar Flemström and Olof Nylander. Both groups focus on neurogastroenterology. In vivo physiology using animal models forms the major part of studies. Animal models are complemented by cell physiology, where membrane receptors and intracellular signalling are studied at the molecular level.

The goals of the Flemström group are to elucidate the pathophysiology of the irritable bowel syndrome, regulation of body weight and the pathophysiology of overweight. These are medically highly relevant, timely and ambitious goals for a small group. Functions of enterocytes and enteroendocrine cells form a major part of the reported studies, but the links to the original aims remain elusive in many parts of the report.

The Nylander group is specialized in duodenal physiology. Response of duodenal functions, like contractility and fluid absorption, to constituents of the duodenal lumen are studied using an animal model developed in the project. The goal is to understand duodenal physiology in general and particularly mucosal defense. Such knowledge is medically relevant to unravel the pathophysiology of intestinal diseases, such as functional dyspepsia.

Quality of research

Both groups of the unit of physiology are highly specialized in neurohumoral control of the gastrointestinal tract. The groups are undoubtedly competent in their own specific fields. The groups publish mainly in internationally well-recognized journals of physiology, such as the *American Journal of Physiology* and the *Journal of Physiology*. The finding that melatonin mediates neural stimulation of duodenal mucosal bicarbonate secretion is a highlight in the research report (J. Clin. Invest., 2001). However, continuation of research based on this finding remains somewhat unclear. Overall, the unit reports studies at an internationally recognized level.

Research environment and infrastructure

The personnel of the unit consists of two senior researchers, one postdoctoral fellow, one Ph.D. student and two technicians. The unit is quite small to be internationally highly competitive. The small size of the unit could be compensated by tight collaborative links within the Department of Neuroscience. Unfortunately, the unit appears rather isolated within its own department. Both

groups of the unit have created their own research models; infrastructure of the department is adequate for the projects.

Networks and collaborations

The unit has been active in its attempts to build a research network at the European level. So far, this has not resulted in strong improvement of research resources.

Opportunities for renewal and emerging science

The panel gets the impression that the groups aim at continuing on their established specialized pathways. The junior faculty activities appear limited.

Actions for successful development

The Department of Neuroscience has many groups studying central mechanisms of feeding behaviour. Much of the research in the unit of physiology deals with peripheral parts in the physiology of feeding behaviour. Combined efforts to build a strong research theme including both the central and the peripheral parts in the feeding control and in disorders leading to obesity is an excellent opportunity for the department. The panel suggests that the groups within and outside of the unit of physiology should seriously consider their common interests in feeding control and obesity, ranging from molecular/cellular studies to systems physiology. The groups of physiology have set up very valuable animal models; such animal models are currently increasingly needed for phenotype analysis of mutant mice created to study physiological and pathophysiological mechanisms. The panel sees that the Department of Neuroscience also needs *in vivo* physiological models in the future in multidisciplinary efforts to understand biological regulation and encourages further development of research models using this physiology.

28.3.4 Comparative medicine

General comments

Comparative medicine consists of the small research group of Klas Abelson with one PhD student and three undergraduate students. The idea of the group is to combine expertise in laboratory animal science to the research of the Department of Neuroscience. The group focuses on the effects of analgesic treatments on the stress response in rats and mice. The PI has an Assistant Professor level position in laboratory animal science, supported by the Swedish Research Council and the Swedish Animal Welfare Agency.

Quality of research

The publication record of the group is in specialist series devoted to pharmacology and toxicology and to laboratory animal science, with some con-

tribution in neuroscience. The panel is of the opinion that the quality of this research cannot be evaluated within the framework of neuroscience research.

Research environment and infrastructure

The Department of Neuroscience has the relevant infrastructure for the pain research of the group. The group is rather too small to be competitive in research activities.

Networks and collaborations

The group collaborates with Aldskogius/Kozlova within the Department. International networking includes the Department of Experimental Medicine (Copenhagen), the Department of Veterinary Anatomy and Physiology (Nairobi) and the DiLab company (Lund).

Opportunities for renewal and emerging science

The topic of the group, pain research in animals and its possible applications in human analgesic treatments, is a highly competitive neuroscience-related research area. Possibilities for translational research are obvious in the research area. Furthermore, national and international regulations by the EU are becoming increasingly important as regarding analgesic treatment of laboratory animals and their welfare in general. From this viewpoint, the group is expected to be a valuable asset for the Department of Neuroscience and the local animal facility. This could involve teaching of PhD students in handling and welfare issues of laboratory animals.

Actions for successful development

A closer contact to pharmacology of the Department of Neuroscience might be helpful to enhance the scientific impact of the group.

28.3.5 Neurology

General comments

The unit is a small one with only one permanent staff member but 23 other staff; there is also a vacancy for a professor. There is a substantial clinical and teaching load with responsibilities for a large population. The department has four research groups; in movement disorders, epilepsy and tumours, clinical neurogenetics and neuroinflammation/stroke, but the last of these is based outside the department for administrative reasons, and this is unfortunate. There is no specific laboratory space for the unit and it suffers to some extent from being isolated from other research groups in a primarily clinical setting. It is also not clear whether the department considers itself to be mainly a clinical grouping with research support or a research group within the university with considerable access to clinical material, and at present it seems to fall

between these options. There are several research students but no information was given about the annual output of MD and PhD degrees.

The published output of the department is small and of variable quality. This suffers to some extent from being spread over a large number of topics, and it is difficult to find a common thread in the many lines of research being pursued. The staff are all relatively new to their posts and need time to become established but at present the general direction of research effort is unclear and seems to be opportunistic rather than strategically based.

Quality of research

There are no consistent research strands. Topics include the pharmacokinetics and drug delivery of treatment in Parkinson's disease, an unusual form of movement disorder due to manganese toxicity, longitudinal studies using PET scans, proteomics, the creation of a brain bank, studies of epileptogenesis, and the neurogenetics of rippling muscle disease. Whilst individually these may hold particular potential, collectively they suffer from being unidisciplinary investigations with limited possibilities for development. It is unlikely that the four groups can be sustained in the longer term without a clearer integrative focus. The stroke/inflammation group has had greater success with wider collaboration and this model could be adopted by the group as a whole, preferably with the stroke/inflammation work being linked to the department. The quality of the different research projects within the other three sections is currently acceptable but could be reinforced. The development of a brain bank would seem to be a high priority for this group and would also be valuable to many other research groupings.

Research environment and infrastructure

There does not appear to be a clear strategy of development within the unit, and whilst this might be understandable with relatively new staff it needs to be addressed urgently. Currently researchers are working individually with very limited interaction with others. If surrounded by like-minded colleagues and reinforced by links to other departments, they would feel much more supported. The department has tremendous potential as a bank of important clinical material, and good links to clinical neurophysiology, psychiatry, pharmacology and neurosurgery would be a great boon to work elsewhere. There is a general feeling that the department is being overwhelmed by clinical responsibilities but if the research is closely linked to these responsibilities there could be synergistic development with benefits on both sides.

The department might also be considered to be too small for its role and the possibility of merging its work with a larger group might lead to the development of dedicated space as well as promoting collaboration.

Networks and collaborations

There are limited national collaborations (eg, Swedish Proteome Resource Program) and one with Estonia but these should be expanded in connection with a new departmental strategy.

Opportunities for renewal and emerging science

There is a great opportunity for the department to be at the forefront of research developments in clinical-based neurological research backed up by collaboration with other departments such as the dementia group (Lannfelt), neuropsychiatry (Wiesel) and genetics and developmental biology (Kullander). A research strategy linking other departments within neuroscience would clearly be of value here, and should be jointly pursued.

Actions for successful development

A collective research strategy for the unit is needed urgently. Current research projects should be integrated within this and ways of developing them more productively included. We have already suggested that all units within the Department of Neuroscience might meet to ensure that this strategy covers several units, and neurology would benefit greatly from such an exercise.

28.3.6 Clinical Neurophysiology

General comments

The unit is led by Larsson. This is a very active unit well known internationally for its research. In historical perspective, the most important contribution from this department probably has been Torebjörk's brilliant research on C-fibers which represented a breakthrough in clinical neurophysiology and pain-research and has been of top international quality. Currently the unit has nine research groups (Stålberg: motor unit in health and disease; Sandberg: postpolio syndrome; Rostedt Punga: Neuromuscular junction; Flink: Epilepsy; Axelsson: intraoperative monitoring; Winkler: axonal plasticity; Edebol Eeg-Olofsson: Pediatric CNS; Torebjörk & Schmidt: microneurography; Larsson:muscle biology). The external funding of each of the research groups varies but, for most groups it is less than SEK 200.000/year which may hamper research somewhat. Although the quality of research is high (see below), the productivity measured as the number of publications from each of the groups also varies somewhat. Also the number of PhD students seem somewhat limited considering all the different research focuses of the department. However, the presentation of the groups clearly demonstrated ambition to further improve the quality of research and expand research staff to achieve this goal.

The unit also has a website recommended to the panel for further information. However, this website is outdated (e.g. the latest poster update is from 2005; some authors list only publications up to 2003). This gives an impres-

sion of a group that have achieved high international standard, but is struggling to maintain this position.

Quality of research

The quality of research is currently of high international standard across the different research groups. Besides the already mentioned bench-marking studies of Torebjörk and collaborators, the unit has published several important papers (e.g. Larsson and co-workers a paper on the defective function of mutated myosin in MyHC Iia E706K myopathy). Stålberg's research on developing EMG methods and telemedicine network is also an example of high quality research.

Research environment and infrastructure

The panel got the impression that the unit has a reasonable space for research, but noticed that the research staff felt the current space limited with regard to further expansion of its activities. Compared to most other units of the Department of Neuroscience, the presentation of the neurophysiological unit was dominated by older researchers. Although this may represent continuity of high quality research, it may also suggest some potential problems regarding recruitment of young researchers which may cause problems in the future.

Networks and collaborations

The international networking and current collaboration is good. The telemedicine network has already been mentioned. The unit is also part of a European network sponsored by an unrestricted grant from Astra Zeneca.

Opportunities for renewal and emerging science

The collaboration with other units within the Department of Neuroscience is not optimal and some of its research (e.g. pre-operative evaluation of epilepsy patients) might benefit from including new emerging methods for assessing brain function such as fMRI. A closer collaboration with neurology is also an opportunity for improving the clinical implication of their work. Some research groups, in particular the EEG group, may also benefit from a closer collaboration with neuropsychologists. The studies of the effect of different drugs on spinal cord injury may benefit from a closer collaboration with the department of pharmacology. Another potential problem is the number of researchers within each research area. Several research groups within the unit are rather small, implying that they may be vulnerable in the future (e.g. pain research, pediatric neurophysiology, motor control research, epilepsy). The many aging researchers compared to young ones increase this potential problem for the future.

Actions for successful development

The panel got the impression that considering the number of research topics, the staff allocated to each one is probably too small. In order to remain internationally competitive, the unit may consider to narrow its research and focus more in the future. The unit should also consider developing a closer collaboration with other units within the Department of Neuroscience. Finally, the unit should develop a plan to recruit more young researchers.

28.3.7 Unit of Developmental Genetics

General comments

This unit is led by Klas Kullander who is currently funded by the Swedish Research Council. The research group has a staff of 12 including 6 postdocs, 3 PhD students and 3 undergraduate students. The presentations from the group signalled clear ambitions and strategies and attested to a high ongoing activity. Four areas were identified as being of particular interest to the group: development and function of neuronal circuits, mechanisms of excitotoxicity in neurological disorders, Eph and ephrins in cell communication, and genetic tools for functional analysis of the nervous system. The group commands a series of potent and state of the art techniques that make it an attractive partner for internal and external collaboration, which should help increase its competitiveness on the international arena.

Quality of research

The panel is of the opinion that the Unit of Developmental Genetics has the potential of establishing itself among the leading groups internationally in the field of neuronal circuit analysis. Already at this early stage the group has left its mark in the field. Notably, the group recently published important observations in a transgenic model based on deletion of the gene encoding the vesicular glutamate transporter VGLUT2. In his earlier work performed elsewhere, Kullander has published seminal observations on the roles of Eph and Ephrins.

Research environment and infrastructure

The group is young and dynamic and has established local collaborative networks within several topics including ALS, schizophrenia, clinical neurogenetics, and traumatic brain injury. Obviously the group is vulnerable: according to the information made available to the panel it is funded in its entirety through external sources (except for a startup grant from Uppsala University). Despite the lack of significant local funding the group has been able to build up an impressive range of methods and technologies.

Networks and collaborations

As described above, the group is engaged in several collaborations within the department and displays a clear willingness and ability to unleash local synergies. However, the panel identified the need for an even stronger integration with expertise in schizophrenia, to adequately exploit the potential of the VG-LUT2 knockout model.

The group is involved in a number of international collaborative projects. However, there seems to be a potential for an even stronger interaction with international partners. Efforts should also be made to attract support from the EU 7th framework programme.

In regard to the projects focusing on the central pattern generator it would be logical to look for possible synergies by interacting with groups performing similar research in other species.

Opportunities for renewal and emerging science

The Unit of Developmental Genetics has the potential of establishing itself at the international forefront. The ambitions of the group are high but realistic, given the solid expertise and technology base that the group enjoys.

Actions for successful development

There is an obvious need to reduce the group's dependency on external funding.

28.3.8 Neurotrauma consortium

General comments

This is an excellent highly productive group that shows all the advantages of translational research from animals to man. This is achieved because the different elements, from neuroanatomy (Aldskogius/Kozlova), through basic neurochemistry and molecular studies (Hillered/Ebendal/Hallböök), to clinical practice with traumatic injuries (Enblad), are all integrated within the same administrative structure within the department. Because the focus of all these disciplines has been on the core subject of traumatic injury and subsequent restitution of neural tissue they have interleaved remarkably well and have benefited from hybrid vigour.

Quality of research

The level of research is of very high international quality. The formation of UBIC (Uppsala Brain Injury Centre) has enabled the group to collaborate well with other international centres and obtain collaborative grants. The work on BMP signalling, neuronal regeneration and animal modelling in traumatic brain injury is particularly strong. The publication record is also very good with about 30 high quality papers per senior researcher in the last five years.

Research environment and infrastructure

The research environment is excellent. The group interdigitates well and the level of activity from PhD and medical students is particularly high. There appears to be a high level of *esprit de corps* in the group that both promotes and reinforces excellence.

Networks and collaborations

The networks established by the Department are a strong feature underpinning its success. The Uppsala Brain Injury Centre is a very strong group of 11 high quality researchers and the international advisory board of nine members from the US, UK and Germany having high international credentials, also testifies to the influence of the group. BrainIT, an EU initiative based in Glasgow, is also a very useful collaboration.

Opportunities for renewal and emerging science

The unit has been highly successful, particularly in its work on animal models of traumatic brain injury and acute effects of trauma in man. It is less involved with longer term outcome and a case could be made for the rehabilitation medicine to also join with the group to be involved in such studies.

Actions for successful development

UBIC has tremendous possibilities for growth and should be encouraged by the University. The possibility of increased funding to achieve its aims should be considered even though the gains will not be immediate. It may need additional space to expand its work at some point.

Other issues

There are several medical students involved with projects and their work is considered highly positive. It is not quite clear what implications there are for such students at what is, after all, a very early stage in their career.

28.3.9 Retina/development

General comments

The group is mainly concerned with studies on the development and regeneration of retinal neurons. The group is led by professor Hallböök and has the staff of six post-doctoral and PhD students. The group investigates retinal development, and is currently being integrated in the neurosurgery/neurotrauma consortium (see above). It has concentrated on chicken embryology in its work and demonstrates the value of a long-term strategy of enquiry into how retinal neurones are formed and the evolution of neurotrophic factors that govern the development and fate of retinal neurons. It illustrates the value of a clear focus on the exact procedures involved in the evolution of subtypes of neurones in the retina and what factors are involved in the regulation of cell death,

plasticity and specification. This has been carried out with the aid of good networking and collaboration.

Quality of research

The quality of research is of internationally high standing. The group, largely through its clear strategy, has made significant advances in understanding retinal development and appears to have been fortunate in using the chick as a model for this. The way in which the group has gone about obtaining links with others in the field across the world deserves particular commendation.

Research environment and infrastructure

The research environment is good. Although the group is small it works together well and is synchronized with the work in hand. The cross-national supervision of research students in the field is especially notable.

Networks and collaborations

The networks within which the group is established represent an excellent example of collaborative networking. The links with the Centre for Functional Genetics (Leif Andersson) and the European Union Network on Neurotrophic Interactions across six countries (organised from Uppsala) have been very successful, have helped to link vertebrate and invertebrate visual research and shown both their important similarities and differences. This work has continued with other collaborators in Spain, Argentina and the US to understand the processes involved in the generation and protection of retinal neurones.

Opportunities for renewal and emerging science

The achievements of this small group have been considerable. As developments in visual science are now moving forward rapidly, the group seems to be in an excellent position to exploit their advantages. We consider it likely that several of the students and post-doctoral researchers might want to stay in the group and hope that resources can be found for them.

Actions for successful development

There is a bold program of research that expects in the near future, in collaboration with existing networks, to be involved in transplantation of cells to the retina, identification of transcription pathways, and development of stem cell research. It is of value that the transfer of this research from the chick to man is not as problematical as in many other areas of neuroscience. Therefore, translational research is expected to be more rapid.

Other issues

Eight postgraduates are currently being supervised and three successful students have been supervised in the past. The work of the students is highly relevant to the main themes of the group.

28.3.10 Ophthalmology

General comments

This comprises a small unit whose main interests are a little different; one group is concerned with the ophthalmologic aspects of prematurely born children, principally the retinopathy of prematurity, and studies of ophthalmology in childhood diseases, and the other is primarily interested in retinal blood flow and physiology. The paediatric ophthalmology group has only one university member; it is limited by its clinical workload with the associate professor only having one day a week for research activities.

Quality of research

The research output is limited and suffers from constituting individual rather than collective interests. It is difficult for ophthalmology and visual sciences to become integrated into other departmental work and much depends on the ability to link with other like-minded departments, in the same way that the retinal group has done with considerable success. At present its quality is acceptable.

Research environment and infrastructure

The research environment is not especially good although the paediatric group deserves credit for maintaining a strong body of research students despite very limited resources.

Networks and collaborations

The networks established by the group are good nationally for the paediatric ophthalmological group but not with the second one concerned with physiology, which appears very isolated.

Opportunities for renewal and emerging science

The work of this group needs to be evaluated within the context of the new strategy of the department. At present the teams are working quite independently and, whilst it is to some extent understandable it is not productive and is unhelpful for students working within the group. There are enough potential collaborators and mentors within the Department of Neuroscience to assist this development.

Actions for successful development

Visual science is an important part of the Department of Neuroscience and an integrated strategy would allow the two groups to thrive.

28.3.11 Rehabilitation medicine and logopaedics

General comments

This comprises a fairly small unit but with overlapping interests in the long-term management of traumatic brain injury and chronic pain. There is only one full-time professor but several PhD students in the unit. The work of the unit is largely involved with long-term studies and interventions for traumatic brain injury but much of the current work is linked to motor problems and is somewhat haphazard in its focus.

Quality of research

The research output of the department of rehabilitation medicine is limited (2 papers in 2003; 9 in 2004; 1 in 2005 and 4 in 2006). However, with 4 papers published in 2007 and four submitted, the output is reasonable considering the low number of staff. The publication in rather low impact peer reviewed journals must be viewed in the perspective of there being no high impact journal in rehabilitation medicine.

However, the current national cohort data (Octopus study) and the randomized controlled trials of early intervention in patients at high risk of persisting disability and the Botox study are likely to generate more papers soon. The level of research is regarded as acceptable.

Research environment and infrastructure

The research environment is potentially good, particularly as the group is close to other departments - Neuroanatomy (Aldskogius), Traumatic brain injury (Enblad) and Developmental Biology (Ebendal), but the opportunities of collaboration have not been exploited fully. This department is clearly focused on clinical outcomes but there are advantages in closer links for both teaching and research and these should be developed.

Networks and collaborations

The collaborations with the national study of early intervention and the international Botox study are good but there are many opportunities for joint working within Uppsala University that could be exploited also. The links to clinical rehabilitation services also appear to be under-used.

Opportunities for renewal and emerging science

The department could be energized by stronger collaborative arrangements, not least as it is a small unit with a need for expansion of its research interests. Rehabilitation itself is going through a process of renewal worldwide and the need for linked interdisciplinary research is imperative if Uppsala is to maintain a high position in this field. There is currently too little research in the department that matches the stated mandate of the department to restore and

support body function, activity performance and participation in all those with complex long-term disabilities.

Actions for successful development

The existing plans for development of the unit are a little diffuse and it is far from clear how this is to develop. The future of the unit needs to be discussed as part of the long-term strategy for neuroscience as a whole, and certainly needs a much more closely integrated structure.

Other issues

Although there are several PhD students, their work seems to have a low profile and needs to be linked to the activities of other students in neuroscience.

28.3.12 Physiotherapy

General comments

The section has one professor and 11 lecturers of which the majority seems mostly involved in teaching. They support two research fellows and 2 PhD students within the section and 6 outside Uppsala.

Except for some collaboration with neurology of uncertain significance, there is no collaboration with other units within the Department of Neuroscience. The overall impression is that this section is struggling to find its main focus of research and does not fit well into the Department of Neuroscience.

Quality of research

The section has at least four “main research areas” with emphasis on rehabilitation: neurological and geriatric disorders (e.g. cervical dystonia, stroke whip-lash related problems), cardio-respiratory distress, nursing home problems, and primary care complaints (pain). The methodology varies from laboratory studies (physical training) to rating of movement and clinical - behavioural intervention and assessments.

The research efforts seem to lack a specific focus and do not seem to be hypothesis-driven. The output measured as the number of papers in international referee-based journals is modest, but the low number of full-time researchers has to be taken into account. The publications are mostly in specialist journals with rather low impact factors. In conclusion, the quality of research is acceptable.

Research environment and infrastructure

There is a lack of a shared overall long-term scientific strategy within the section. People seem to work rather independently with their own ideas and interests.

The teaching load and clinical obligations seem to hamper innovative research and the infrastructure for research (technicians, research nurses, secretarial support) seems insufficient. The number of staff is also very limited which makes comprehensive research difficult.

Networks and collaborations

There is some collaboration with both Swedish and international researchers, but the extent and implication of this collaboration for the research is difficult to grasp. The panel has not been able to identify current participation in international networks.

Opportunities for renewal and emerging science

The department of physiotherapy does not seem to benefit very much from collaboration with pre-clinical units within the Department of Neuroscience, and it is hard to see how that can change in the future. Both their thinking and methodology suggest that they should be allocated to another department within the university (e.g. public health which contains both geriatrics and primary care medicine).

Actions for successful development

Relocation of the section of physiotherapy to another department of the medical faculty should be considered to enhance synergistic efforts with other research groups and to improve the quality of research. However, wherever they may be relocated, the unit should consider to get a consultant from outside, or an international advisory board, to help them focus more and develop more precise research visions for the future.

29. Panel 24

29.1 Some overall comments by Panel 24

The panel was very impressed with what it saw during the site visit in Uppsala. In order to maintain the high level of research we would like to raise a few aspects in which we would like to recommend to pay special attention.

1. We were informed that 85% of the faculty at the University of Uppsala are graduates from the same University (either graduate or undergraduate). This is obviously a very high number and greater admixture would be welcome. Young scientists who have done their PhD in the University should be encouraged to move abroad for the post doctoral training and should consider returning to other Swedish/Scandinavian Universities. This increases the overall attractiveness of the University of Uppsala for super recruits for senior faculty positions.
2. The priority of research infrastructures including core facilities should be a high priority for any ambitious research institution and university. The Uppsala University should develop mechanisms that provide a solid institutional support for its core facilities. The facilities should be evaluated and monitored for their performance. The current system where almost all running costs are covered by user fees is not recommended. This gives a signal that these technology platforms are not a high priority for the institution. There are different solutions to this in different core facilities, but the overall nominator is that the continuation of the existence and operation of the facilities is too unsecured; at least a part of the staff should have secured salary funding.
3. The career prospects of young scientists is a serious problem. If career prospects are too scary, it does not recruit the most talented fraction of the generation.
4. We got the impression that the overall group size is small. It is hard for small groups to be competitive on an international level. The Ludwig Institute is a good example, where high success is based on a critical mass working around a problem.

29.2 Department of Genetics and Pathology

29.2.1 General assessment

The review panel would like to stress the extraordinary high level of science which was presented to us. The breath of high quality research is very impressive and there is no question that many of these groups represent international top. All of the presented groups are at a minimum high international standard. All suggestions below should be taken as constructive ideas to maintain the high level also during years to come.

The research in the Department is organized in five research programs: Molecular Tools, Molecular and Morphological Pathology, Cancer and Vascular Biology, Hematology and Immunology, Medical Genetics and Genomics.

Especially impressive is the innovative, brilliant science produced by Dr. Ulf Landegren's team in the Molecular Tools program (an obvious "golden nugget"). The unique flow of method discoveries and inventions has lasted for decades without any signs of slow down. Several discoveries from his group have resulted in wide implementations mainly in nucleic acid variant detection. This group is globally very, very unique. It is ironic that this group faces some challenges in the conservative funding structures. Some of the funding critic is focused on the younger members in the team: in this uniquely stimulating research environment some of the younger PIs are not easily recognized as independent scientists by funding agencies. On the other hand, it is clear that such innovative research needs a critical mass of sufficiently experienced scientists to enable brain storming and development of new ideas and strategies. We would like to state that if scientists in such a group face difficulties in funding or recognition in their academic careers, the problem is in the system not in the group. A special positive aspect is that lately the techniques developed in this group are also implemented in other groups and even in core facilities on the campus.

Another very unique and unusual project is the "Human Protein Atlas" project by Mathias Uhlen and Fredrik Ponten. This project is run as a joint effort between KTH and Uppsala, with 1/3 of the funding directed to Uppsala and belongs to the Molecular and Morphological Pathology Program. Unfortunately the Uppsala partner, Fredrik Ponten was not present and thus the panel did not have an opportunity to ask specific questions about the Uppsala site. Also this project is globally unique, a tour de force to produce antibodies for the research community. Such a high throughput production project is somewhat challenging for young scientists. Yet, the group has managed to develop at least some projects for graduate students, although specifics of them were not presented. It has been a major effort to get this large project off the ground and thus scientific reports are expected to appear later this year and thereafter. This project provides a very unique platform for future science, no Pathology unit could dream for better. It will be up to the researchers to effectively use the tools created by this mission. It would be important that when

new faculty is recruited to the department that they would be enthusiastic to use these unique opportunities.

Dr. Per Westermark's team, a considerably smaller group than the two previously presented, belongs also to the Molecular and Morphological Pathology Program. The group has a long and strong track record in studying mechanisms of amyloid deposition. Although the team is relatively small, it publishes actively and regularly in top journals. Per Westermark is also coordinating one EU project on amyloid disease mechanisms, providing additional visibility to the Uppsala group. One of the threats is that this line of research would not continue once Dr. Westermark retires in a few years.

The Molecular and Morphological Pathology listed additionally nine PIs whose work was not presented. These PIs are mostly occupied by a clinical load from the Hospital and thus their scientific activity was modest. This is natural for a department which has a heavy clinical load. On the other hand this is also one of the threats if pathologists in an academic environment are not scientifically active. The panel is somewhat concerned that the Pathology arm of the Department is not optimally using the opportunities provided by the "Human Protein Atlas" project. This is also an important consideration when new faculty is recruited.

The Cancer and Vascular Biology Program consists of two branches, the Vascular Program and the Cancer Program. The Vascular Program has four PIs: Lena Claesson-Welsh, Pär Gerwis, Johan Kruger and Anna-Karin Olsson. Two PIs were available for presentations and questions. The program is led by Lena Claesson-Welsh who is one of the stars in Uppsala. She has an impressive track record in vascular biology and can attract major funding. This program had a good balance of young and more experienced PIs. The enthusiasm and scientific quality of Dr Kreuger's presentation was particularly impressive. Among the top research programs within the Department, this program had a more classical, academic composition, compared to Molecular Tools and Molecular and Morphological Pathology: each group has maximally 10 members, composed from post docs and students.

The Cancer Program is headed by Dr. Bengt Westermark and consists additionally of one young PI, Lena Uhrbom. Their focus is in revealing early mechanism leading to development of gliomas, a highly malignant brain tumor. Dr. Westermark has a long and successful career in this field. Lena Uhrbom has provided the group with a number of mouse models as a harvest from her post doctoral training in US. This has widened the available models and "reagents" necessary for competitive research in the field. Lena Uhrbom is Bengt Westermarks previous student and following Dr. Westermarks foot steps. The collaboration within the campus and within the program was a strength of this dual group.

The Hematology and Immunology program consists of six PIs of whom four were presenting their projects. Three of the projects had similar overall themes focusing on mechanisms in haematological malignancies. One, Dr.

Heyman's project is somewhat of an outlier, having a focus on basic immunological mechanisms involved in antibody feedback regulation. Dr. Heyman has a long track record in the field. Although the mouse is an interesting model, the project might benefit from an addition of a translational aspect and some redirection of the scope. It also seems, that an environment with more groups focused in immunology might be beneficial for the project. Dr. Helena Jernberg has an interest in understanding basic mechanisms in Multiple Myeloma. This is a very interesting project with a very good track record. This project uses efficiently opportunities provided by the environment in Uppsala, including its translational components, even a bridge to therapeutic applications. She publishes in first rate journals and has a good focus and genuine enthusiasm and is well networked. Another very strong, relatively young PI is Dr. Richard Rosenquist, who is tackling basic mechanisms in chronic lymphocytic leukaemia. The panel felt that he is one of the true "golden nuggets" the University evaluation is looking for. We were very impressed. The project is very promising. He reflected true leadership and seemed to have a great talent in building networks, something which is important if you like to make a difference in this type of research. He also takes good advantage of the environment in Uppsala.

The Medical Genetics & Genomics Programme has strong traditions and is well known in the global genetics community. Due to the time constrain we had an opportunity only to hear two project presentations, although the program consists of seven PIs. Dr. Claes Wadelius group has a genomics approach to characterize epigenomic events and recognize downstream regulated genes of transcription factors. This is a major shift from Dr. Wadelius previous work. He demonstrated high enthusiasm and drive in this project which is in a very competitive field. For optimal success this project would benefit of a very strong network. Dr. Marta Alarcon's project focuses on SLE susceptibility. This is a well focused project, she has a good track record and ambition and very favourable prospects. The projects of the non-presenting PIs are hard to evaluate, but their track records demonstrate active, solid research with good publications. The adenovirus project by Dr. Ulf Pettersson is worth special mentioning; the fact that he from his current administrative position can run productive and exciting science is a true achievement. The Program, although somewhat fragmented includes strong PIs. There seems to be a slight lack of young PIs. It includes three newly recruited scientists (Tobias Sjöblom, Marie Allen, Chandra Kanduri) who all are still at early stages of their independence and have most of their reputation from their superb postdoctoral training. It should be noted that this is the program which includes the Department chairs project and was in a "true democratic" setting provided the same time as much smaller programs and thus individual PIs did not get the same attention as in the other Programs.

29.2.2 Quality of Research

As indicated above, the quality of research is outstanding, international top. Uppsala should be very proud of its groups at the Rudbeck laboratories. No low quality groups were presented. The harsh reality of the lack of internal funds results in a situation where only groups who can attract external funding can stay alive. Yet, there are threats and problems which should be solved in order to maintain the high level of research also in future. These include the career opportunities of young scientists, the lack of University/Faculty support to core facilities and the inbred nature of scientists, especially in the Pathology section of the Department. These aspects are summarized in a separate overall statement.

29.2.3 Research environment and infrastructure

The research environment is extremely good. For the most part the Department is equipped with very modern instrumentation and the superb scientists create a favourable intellectual environment. However, the funding of infrastructures and core facilities seems not well developed. The core facilities are mainly run on user fees. This is neither a viable nor an internationally recommended way for academic core facilities. This results easily in a “kiosk” type of operation where intellectual guidance cannot be provided to groups and no risky developmental work can be performed. It seems as the core facilities would not be a top priority for the Department/University/Faculty. Current forefront biomedical research relies on expensive and ever evolving technology, which needs institutional input. Without good operational core facilities it is very hard to remain scientifically competitive. A modern, well organized infrastructure is a major component in attracting the best and most ambitious faculty. This aspect is discussed in the overall summary. The existing biobanks (eg. the haematological sample collection) are crown jewels which need institutional support for professional running and maintenance. Currently the efficient use of this biobank is hampered by an undefined structure, undefined funding and operational procedures.

29.2.4 Networks and Collaboration

All groups are highly competitive and thus also use opportunities provided by collaboration with good groups both within the campus, nationally and internationally. Richard Rosenquist's numerous networks for sample collection were especially impressive. The lack of collaboration with the Departments in Pharmacy is striking. The reason for this remained unclear.

29.2.5 Opportunities for renewal and emerging science

As for most Scandinavian Universities, also for Uppsala recruiting truly enthusiastic young PIs who have a passion for success in science is not trivial. There were two young investigators in whom we saw special potential. Dr. Johan Kreuger in the Cancer and Vascular Biology Program had an exciting project and the right drive for a potentially successive research career. He should be recognized as someone in whom institutional support should be taken as an investment. Dr. Richard Rosenquist's project, his drive and his evident leadership skills are also something to invest in. The panel was very impressed.

The Scandinavian academic track is suffering from a lack of a "tenure track" system, where there would be logical steps at each phase of the carrier. The current problem is that there are almost no mechanisms after the "forskarassistent" phase. Although it is clear that everyone should not continue in research after this phase, the current selection is too harsh. It is unrealistic to think that after five years (the term of "forskarassistent") a young investigator would be mature for a full professorship. There is typically just a black whole to provide. This is a special problem that should be a focus of science politics not just on national level, but also within the university system. If the career prospects are too uncertain, it does not attract the best fraction of the age group to research.

29.2.6 Actions for successful development

In the current era interaction and easy access to meet other groups within a given field is key. The panel felt that the cancer groups are somewhat fragmented on the campus. The Rudbeck laboratory houses some relatively small cancer groups, which could benefit of a space, which would be shared by more groups in the field of cancer biology. Reorganization of space is typically a slow task, but should be seriously considered if that improves interaction between groups interested in similar research.

The development of institutional support for core facilities is of outermost importance for future success.

29.3 Department of Medical Sciences

29.3.1 General assessment

This panel evaluated only two technology platforms of the Department, the SNP Technology Platform and the Expression Array platform.

The SNP Technology Platform is chaired by Dr. Ann-Christine Syvänen, who has a strong international reputation in developing and implementing techniques for genome variation detection. Uppsala is very fortunate to have

such a strong expert in charge of a technology platform. The group consists of experts in molecular genetics and in molecular techniques, as well as data handling experts, including staff with sophisticated programming skills. The platform has completed 80 projects. About 50% of these projects are from Uppsala, 28% are from other parts of Sweden and the rest are international projects. Dr. Syvänen is a major player in EU-funded genotyping projects. The annual budget for the facility is about 25 MSEK. The facility is well equipped with most modern genotyping technology. In fall the laboratory will receive a new, next generation, high capacity sequencing equipment. Dr. Syvänen's research publications reflect on one hand her input in developing genotyping techniques and on the other hand collaboration and expertise in genotyping projects. Lately she has also developed an own research line in identification of variants predisposing to complex traits. The facility is accredited by SWEDAC.

Dr. Anders Isaksson is running an Affymetrix expression analysis platform. The group consists of four members. This includes both project planning, wet lab chip hybridization and signal analysis. It was especially impressive that the unit provides help and expertise in analyzing the expression array results. The unit has been functional just over a year, but has already completed a number of projects. The unit also plans to expand its activities in Affymetrix based genotyping and is currently providing clinical SNP analysis service for pharmacogenetic studies. The potential plans to expand to whole genome SNP analysis should be done in cooperation with the SNP-analysis platform to avoid unnecessary overlap of personnel and data management resources.

29.3.2 Quality of Research

Only research by Dr. Syvänen's group was presented, Dr. Isaksson's research was evaluated by a different panel. Dr. Syvänen's ongoing projects include a wide variety of genome variation studies from *Drosophila* and bacteria to monitoring allele specific expression of genes in childhood leukemias. Most of these ongoing and listed projects have not matured to publications yet. Dr. Syvänen's special strength is in developing laboratory techniques where she is a world renowned authority. She publishes actively in very good international journals. Here research insight is crucial for optimally running the SNP technology platform.

29.3.3 Research environment and infrastructure

Both platforms are located in the hospital building. There is no doubt that the proximity is beneficial for the clinical groups. On the other hand, these platforms are somewhat isolated from the basic science laboratories, which might hamper the communication between younger scientists. Both platforms are

well equipped and have built a good data management infrastructure, which is networked through EU projects to other European centers.

29.3.4 Networks and collaborations

Both platforms are well networked and have strong collaborations both on the campus, nationally and internationally. The SNP genotyping platform is a major player in large European genome variation studies. Could not be better.

29.3.5 Opportunities for renewal and emerging science

These, relatively small technical platforms are typically very much centered around the director of the platform. A unique aspect of these two platforms is that they are true intellectual core facilities, lead by scientists who have a strong research activity. This is a key in a quickly moving field where the cost of each experiment is substantial. Individual groups need expert guidance in planning most cost efficient experiments. Dr. Syvänen's group has a number of young active students and very competitive staff scientists. However, there are no other faculty-level scientists.

29.3.6 Actions for successful development

Organizing a stable institutional support is key. Modern biomedical research is dependent on top level infrastructure. If a good infrastructure is lacking or is not well organized, it has direct impact in the scientific ambition, productivity and recruiting new faculty. The funding of well organized academic infrastructures should be based on three components: 1. Institutional base support, 2. user fees, 3. funds for capital investments. If one of these is missing it hampers the realisation of the mission. Uppsala and Sweden has invested in getting these well running technology platforms up and running, now they need to foster and maintain their investment.

Special note: Dr. Aarno Palotie, the chair of the panel has collaborated with Dr. Syvänen. They both are investigators in an ongoing large EU-funded project GenomEUtwin. However, the level of collaboration is not substantial and does thus not create a conflict of interests.

29.4 Ludwig Institute for Cancer Research

29.4.1 General assessment

The Uppsala Branch of the Ludwig Institute was established in 1986, Dr. Carl-Henrik Heldin being nominated as its founding director. In his leadership this Institute has developed and flourished. Measured by several parameters (number of publications, number of citations) it is the best performing Lud-

wig Branch in the World. One of the unique aspects of the Uppsala branch is to combine top class research within one unifying theme with superb research training. The unique aspect of the training is in mentoring young PIs to full independence using a rather unconventional strategy; a common research theme is coupled with projects of which some are collaborative with the director and some are independently run by the PI. It is clear that the Uppsala Ludwig Institute is a world class crown jewel that both the University of Uppsala and the Ludwig Institute Organization should be very proud of.

The success of the Uppsala Ludwig Institute should also stimulate the University environment to adopt some of their strategies. The power of a Institute system is that it can focus its research in one theme, which for the Uppsala Ludwig Institute Branch has been signal transduction and more specifically the TGF- β and PDGF signalling pathways. This could result in challenges for young group leaders in growing towards full independence. However, the persistent drive of the director to invest in PI mentoring has been a success and has resulted in a remarkable number of top class independent scientists 10 of whom are full professors in Sweden and abroad. Additionally eight previous post docs from the Institute are now professors at various institutions around the world. This all has been achieved with a rather modest budget of only 35 million SEK (about 3.8 million Euro) per year. This demonstrates that different structures enrich the academic environment. On one hand classic departmental structures facilitate growth of small independent groups and a diversity of research avenues. On the other hand, focusing groups around large themes provides opportunities for significantly advancing the field.

The Uppsala Branch of the Ludwig Institute has currently nine group leaders. One group leader typically spends about 10 years in the Institute and then moves on to independent positions. The current group leaders range from those reaching the ten year maturity and younger once, who have been in Uppsala only for a couple of years. It is striking that the level of “inbreeding” in the Ludwig Institute is much less than in the University Departments; almost every group leader has been recruited to the Ludwig Institute from outside Uppsala.

29.4.2 Quality of Research

As stated above, the scientific production of the Uppsala Ludwig Institute is superb. The publication spectrum is characterized by a constant flow of papers in journals like “Journal of Biological Chemistry”, “Journal of Cell Biology” and “Molecular Biology of the Cell”. The research theme is well focused and aims at excellence and depth. The active scientific production reflects the sufficient number of researchers investing their time and inspiration in one theme. It is difficult for small university groups to produce similar scientific quality and quantity. On the other hand, in the current global competition, these large groups are needed for top research.

29.4.3 Research environment and infrastructure

The research environment and infrastructure is superb. The sufficient number of senior investigators provides an environment where brain storming and efficient project planning is possible. The Institute is equipped with modern tools for cell imaging and protein chemistry. However, similarly as on the Uppsala campus in general, the core facilities are not a major strength. When the Ludwig Institute researchers need genome wide or high throughput screening, they typically collaborate with foreign institutions. To maintain a competitive niche, a strong technical infrastructure is essential.

29.4.4 Networks and Collaboration

The networking within the campus and internationally is superb.

29.4.5 Opportunities for renewal and emerging science

This is a special strength of the site. The systematic mentoring of young PIs towards true, competitive independence is impressive. The Institute applies a similar system as EMBL where young PIs are planned to spend a limited number of years. This is a superb asset for renewal.

29.4.6 Actions for successful development

The major threat is that the Ludwig Institute would decide not to continue supporting the Uppsala site. This would be a true loss for science. The Uppsala branch provides a unique blue print for successful researcher training connected with international top science. Terminating something so successful would be a shame.

29.5 Department of Medical Biochemistry and Microbiology

29.5.1 General assessment

As we interviewed only Professors Rubin, Ronne and Assistant Professor Bjerling the overall assessment regarding the department cannot be done by us. The placement of Ronne and Bjerling at the Department of Biochemistry and Microbiology seems rather interesting and perhaps somewhat unusual as the best synergic situation may not be achieved with the other groups working with diverse non-related projects at the Department.

29.5.2 Quality of Research

Professor Rubin represents an established scientist with more than 100 publications. He has a track record in the research tumor-stroma interaction and a strong background in connective tissue research. He has a relatively small group of four graduate students and one postdoc. The project is interesting and demanding and I wonder if the size of the group is large enough to be in balance with the ambition of the aims. The group publishes in good but not excellent international journals.

Hans Ronne's group now consisting of 10 scientists had moved in 2004 from the Department of Plant Biology and Forest Genetics at the Swedish University of Agricultural Sciences. The group works with functional genomics in model organisms. Their model organisms are *Saccharomyces cerevisiae*, and *Physcomitrella patens*. The projects aim at elucidating basic cellular processes and how the primary carbon and energy metabolism is regulated in plants. Overall the projects can be considered important providing fundamental knowledge on basic biological mechanisms.

Assistant Professor Bjerling represented younger generation of scientists with a small research group. She studies spatial organization of genes in the nucleus using *Schizosaccharomyces pombe* as a model organism. The main methodology used is live cell imaging. Her studies provide important new knowledge about epigenetic mechanisms in gene regulation. As the group is young (although promising) the scientific success of this investigator remains to be seen.

29.5.3 Opportunities for renewal and emerging science

The lack of young scientists, especially postdoctoral fellows was considered to be problematic. Also poor recruitment opportunities are a risk to run competitive science.

29.5.4 Networks and Collaboration/Actions for successful development

Although the placement of Ronne and Bjerling at this Department was considered somewhat surprising, non-conventional physical proximity with the groups having different expertise within the Department provides an opportunity to create innovative new openings.

Part IV:
Bibliometric study

30. External Report from Leiden University

Bibliometric Study of the Uppsala University, Sweden, 2002 - 2006



M.S. Visser and A.J. Nederhof
Center for Science and Technology Studies (CWTS)
Leiden University
PO Box 9555, 2300 RB Leiden
The Netherlands

September, 2007

Research Report to the Uppsala University, Uppsala, Sweden.
Report CWTS

30.1 Introduction

The objective of the present study is to provide insight in important aspects of publication output and international citation impact of the Uppsala University (UU), Uppsala, Sweden.

The covered period is 2002 - 2006 for both publications and their citation impact. The study is based on a quantitative analysis of scientific articles published in journals and serials processed for the Web of Science (WoS) versions of the Science Citation Index and associated citation indices: the **Science Citation Index** (SCI), the **Social Science Citation Index** (SSCI), and the **Arts & Humanities Citation Index** (A&HCI), here briefly indicated as **CI**.

Using bibliometric techniques, the present study assesses the publication output and citation impact of scientists affiliated with UU faculties. The impact, as measured by citations, is compared with worldwide reference values. In recent years, CWTS has made a number of major changes and improvements in its methodology:

- The CD-ROM version of the CI has been replaced by the Web of Science version, which provides a better coverage of publications;
- All impact indicators and worldwide reference values are now calculated *without* selfcitations;
- The algorithm that relates citations to source publications in the database has been improved, resulting in more accurate citation counts. For example, authors with names that are misspelled in citations will usually benefit; finally,
- The assessment of research performance has been extended with indicators focusing on '*top*'-publications, i.e., we look at the number of papers included among the top 20%, top 10% and top 5% most highly cited articles in a particular field.

Non-serial literature has not been included in the present study. Although non-serial literature might be of some importance for UU, on an aggregate level, CI publications account for the major part of the total impact in most disciplines (see Chapter 30.3.2).

There are two main approaches to what research performance indicators should address.

1. The '*past performance*' approach focuses on an *ex-post* assessment of the past performance of a group of scientists from a perspective of accountability of research funds allocated to the research unit during a certain period. Then, retiring scientists and those formerly working in the research unit should be included.
2. The '*back-to-the-future*' or '*prospective*' approach addresses the performance of the scientists who are still active in a particular research unit, from the objective of obtaining a view on the research performance of those who have the task to shape the future of this research unit. Therefore, this *ex-ante* approach has been called 'back-to-the-

future'. Then, it seems appropriate to exclude scientists no longer working in the research unit.

Both approaches relate to the past performance of groups of scientists. However, the policy view underlying the latter approach is more directed to the future, while the perspective adopted in the first approach is more focused on the past.

In this report, the focus is on back-to-the-future results for the period 2002 - 2006.

30.1.1 Structure of the report

The structure of this report is as follows. The bibliometric **indicators** applied in this study are described in **Chapter 30.2**, with an overview in Chapter 30.2.6. **Chapter 30.3** gives the main lines of **data collection**, including analyses relating to CI coverage. **Chapter 30.4** presents the '**overall**' results for UU, while results for faculties and research departments are included in **Chapter 30.5**. Research collaboration is addressed in **Chapter 30.6**. **Chapter 30.7** provides general methodological comments. Finally, **Chapter 30.8** provides a summary of the main conclusions.

30.2 Bibliometric indicators

30.2.1 Introduction

Bibliometrics is the quantitative study of written products of research. It is assumed that scientific subjects develop at an international research frontier (Price, 1963). Research results are communicated in publications that are submitted to evaluation by professional colleagues. In the references of their papers, scientists acknowledge relevant publications by others, as they build on previous work. Therefore, the number of times a publication is referred to gives a partial indication of the 'impact' of a publication, its reception and use by scientists at the research frontier.

In nearly all scientific fields, the scientific journal is by far the most important medium of communication. The Web of Science (WoS) claims to cover the most important 'leading' international journals and serials (such as Annual Reviews) with a well functioning referee system. In addition, the overall citation rate of journals is considered, as well as their timeliness of publication, and adherence to international editorial conventions. Regularly, a limited number of new journals is added, while other journals are no longer covered. More 'peripheral' journals, often national in scope, are usually not covered by the WoS. On an annual basis, the CWTS CI database includes about 8,000 leading international journals from all domains of scholarship.

The process of data-collection and the methodology applied in this study are comparable to those adopted in previous studies on, for instance, physics research (Rinia et al., 2001), biology (Nederhof & Visser, 2004), electrical and electronic engineering (Van Leeuwen et al., 2000), chemistry (Van Leeuwen et al., 2003), the humanities (Nederhof, 2006; Tijssen et al., 2006), medicine (Tijssen et al., 2002) and the social and behavioral sciences (Nederhof, 2006; in press). Publications were derived from a large bibliometric database of scientific publications. This database contains all scientific articles published in serials processed during the period 2002 - 2006 by the Institute for Scientific Information (ISI; now part of Thomson Scientific) for the Web of Science versions of the Science Citation Index (SCI), the Social Science Citation Index (SSCI), the Arts & Humanities Citation Index (A&HCI). The database includes citation data on all journals processed for the SCI, SSCI, A&HCI or **CI** for short. A detailed description of the main principles behind this database is given in Moed, De Bruin & Van Leeuwen (1995) and Moed (2005).

Our work is partly based upon previous work by Garfield (1979), Martin & Irvine (1983), Narin (1990), Van Raan (1997), and Schubert, Glänzel & Braun (1989). Both statistical requirements and imperfections in the citation process (for a discussion see Nederhof, 1988) make it desirable to aggregate across individuals, publications, and citations. Another reason for computing indicators on the oeuvre of a research unit rather than on individual papers is that within an oeuvre, later papers or review papers may draw citations that otherwise would have gone to earlier papers. The oeuvre approach prevents that such a transfer of citations within an oeuvre is treated as a statistical error in the assessment of single papers.

As scientific (sub)fields differ in publication and citation patterns (as visible in differences in for example length of reference lists, or age of cited literature), it is usually not meaningful to directly compare the raw impact of publications from one (sub)field with those of a different (sub)field. Therefore, in our studies raw impact scores are compared to the impact of similar publications within the same journal, or within the same subfield (see Chapter 30.2.2).

30.2.2 Output and impact indicators

We calculated several indicators for the total CI output or ‘oeuvre’ of a research unit, as produced within the time frame of the study (cf. Moed, De Bruin & Van Leeuwen, 1995).

Indicators

A *first* statistic gives the total number of papers published by the research unit during the entire period (*P*). We considered only papers classified in the WoS as *normal articles*, *letters*, *notes*, and *reviews*. Meeting abstracts, corrections, and editorials are *not* included. In a few cases, a paper is published in a journal

for which no citation data are available, or that is not assigned to a CI subfield. These papers are not considered in the calculation of the indicators presented in the tables below.

The next two indicators give the total number of citations received, without (**C**) and with self-citations (**C+sc**). A self-citation (**sc**) to a paper is a citation given in a publication of which at least one author (either first author or co-author) is also an author of the cited paper (either first author or co-author). As an indication of the self-citation rate we present the percentage of self-citations (**% Self-citations**), relative to the total number of citations received ($sc/(C+sc)$).

The *fourth* indicator is the average number of citations per publication calculated while self-citations are not included (**CPP**).

A *fifth* indicator is the percentage of articles not cited during the time period considered (**Pnc**), excluding self-citations.

International reference values: JCSm and FCSm

Next, two international reference values are computed. A first value represents the mean citation rate of the journals in which the research unit has published (**JCSm**, the mean **J**ournal **C**itation **S**core). The JCSm takes into account both the type of paper (e.g., normal article, review, and so on), and the specific years in which the research unit's papers were published. For example, the number of citations received during the period 2002 - 2005 by a *letter* published by a research unit in 2002 in journal X is compared to the average number of citations received during the same period (2002 - 2005) by all *letters* published in the same journal (X) in the same year (2002). Generally, a research unit publishes its papers in several journals rather than one. Therefore, we calculated a weighted average JCS indicated as **JCSm**, with the weights determined by the number of papers published in each journal. Self-citations are excluded from the computation of JCSm.

A unit U that has published two articles in journal X in 2002 (JCS = 3) and one letter in journal Y in 2003 (JCS = 0.3) obtains a JCSm of $(3 + 3 + 0.3)/(1 + 1 + 1)$ or $6.3/3$ is 2.1.

The second reference value presents the mean citation rate of the subfields in which the research unit is active (**FCSm**, the mean **F**ield **C**itation **S**core). Our definition of subfields is based on a classification of scientific journals into *subject categories* developed by ISI (see Chapter 30.2.3). Although this classification is certainly not perfect, it is at present the only classification available to us. In calculating **FCSm**, we used the same procedure as the one we applied in the calculation of **JCSm**, with journals replaced by subfields. In most cases, a research unit is active in more than one subfield. In those cases, we calculate a weighted average value, the weights being determined by the total number of papers the research unit has published in each subfield.

Suppose that journal X belongs to subfield Z, and that all 2002 articles in subfield Z are cited 1.5 times on average in 2002 - 2005, while journal Y belongs to subfield A where all 2003 letters are cited 0.6 times on average in 2003 - 2005. Then, the unit U mentioned before obtains an FCSm score of $(1.5 + 1.5 + 0.6)/(1 + 1 + 1)$ or 1.2.

When a journal is classified in multiple subfields, as happens in a small minority of cases, citation scores are computed as follows. Basically, a paper in a journal classified in N subfields is counted as 1/N paper in each subfield, and so are its citations and FCSm scores.

Main indicators

The two most important indicators compare the average number of citations to the oeuvre of a research unit (*CPP*) to the two international reference values, namely the corresponding journal and field mean citation scores (*JCSm* and *FCSm*, respectively), by calculating the ratio for both. Self-citations are excluded in the calculation of the ratios *CPP/FCSm* and *CPP/JCSm*, to prevent that ratios are affected by divergent selfcitation behavior.

The *CPP/JCSm* indicator matches the impact of papers closely to the publication pattern of research units. If the ratio *CPP/JCSm* is above 1.0, the mean impact of a research unit's papers exceeds the mean impact of all articles published in the journals in which the particular research unit has published its papers (the research unit's journal set). A limitation of this indicator is that low impact publications published in low impact journals may get a similar score as high impact publications published in high impact journals.

The *CPP/FCSm* indicator is free from this limitation, because it takes the impact level of a units' journal set into account. Therefore, it seems the most suitable indicator of the international position of a research unit. If the ratio *CPP/FCSm* is above (below) 1.0, this means that the oeuvre of the research unit is cited more (less) frequently than an 'average' publication in the subfield(s) in which the research unit is active. *FCSm* constitutes a *world subfield average* in a specific (combination of) subfield(s). In this way, one may obtain an indication of the international position of a research unit, in terms of its impact compared to a 'world' average. This 'world' average is calculated for the total population of articles published in CI journals assigned to a particular subfield. As a rule, about 80 percent of these papers are authored by scientists from the United States, Canada, Western Europe, Australia and Japan. Therefore, this 'world' average is dominated by the Western world.

Finally, if a third important indicator, *JCSm/FCSm*, is above (below) 1.0, the mean citation score of the journal set in which the research unit has published exceeds the mean citation score of all papers published in the subfield(s) to which the journals belong. In this case, one can conclude that the research unit publishes in journals with a relatively high (low) impact. It should be noted that the *CPP/JCSm*, *CPP/FCSm* and the *JCSm/FCSm* indicators are not

independent. The value of each one of these follows directly from the values of the other two indicators.

Recent research has shown, that in comparisons across year blocks (e.g., when publications from 2002 - 2006 are compared with those of another year block), it is important to focus on these three main indicators only, as these normalised values are free from influences by distribution and document types effects (Nederhof & Visser, 2004).

Statistical test

We apply a statistical test to establish whether the average impact of a research unit's publication oeuvre (*CPP*) differs significantly from the average impact of all papers in the research unit's journal set (*JCSm*) or from the world sub-field average (*FCSm*) in the subfield(s) in which the research unit is active (see Chapter 30.9 for an explanation of this statistical test). If a research unit has a citation per publication ratio (*CPP*) significantly above (below) the average field (*FCSm*) or journal citation score (*JCSm*), this is indicated in the tables by means of a '+' ('-') symbol directly after the numerical value of the indicators *CPP/FCSm* and *CPP/JCSm*. A '?' indicates that the test has insufficient information to interpret the result.

Due to the presence of error (Moed et al., 1995), only the first decimal of the ratios is usually reliable, given that it is based on a sufficient number of publications ($N > 50$). Even for a quite large number of publications, a 5% difference or shift in the value of an indicator should not be regarded as a significant result.

Most frequently cited papers

An additional set of impact indicators reflects the contribution to the most frequently cited papers worldwide. Two research units may have equal impact scores on the *CPP/FCSm* indicator, but one produces a steady stream of publications that are cited well but fails to produce really high impact publications, while the other contributes considerably to the high impact publications in their subfields (and also has a larger number of less well cited publications). To examine the distribution of frequently cited papers, we have ranked each publication on the number of citations it received up to four years after publication. We marked those belonging to, for example, the 10% most frequently cited papers in a particular subfield in a given publication year. The use of the fixed length four-year citation window implies that the analysis only involves papers published during 2002 - 2003. Moreover, letters were excluded because of their relatively low impact compared to articles and reviews.

Thus, the *P02-03* figure gives the number of review articles and normal articles published during 2002 - 2003. The indicator *Ptop* renders the absolute number of papers that are represented among the top 5% most frequently cited papers world-wide that are similar in publication year, document type, and subfield. The method used in the present study is advanced, as the rank

of papers is calculated based on the actual impact distribution of all similar papers worldwide, and self-citations are excluded.

$E(P_{top})$ gives the expected number of highly cited papers based on the number of papers published by the research unit. This figure reflects deviations from the 95th percentile if tied values occur due to the discrete nature of the impact distribution. Finally, the $A/E(P_{top})$ indicator marks the relative contribution to the 5% most frequently cited papers, and is calculated as the ratio of P_{top} and $E(P_{top})$. Here, a value above (below) one indicates a relatively high (low) contribution to the 5% most frequently cited papers.

30.2.3 Analysis of cognitive orientation

The cognitive orientation of a research unit is analyzed by classifying its papers according to scientific subfields. In the Citation Indices, publications are classified by means of the journal in which they appear into subfields such as 'Ecology', 'Cell Biology', 'Physics, Applied', and so on. These subfields are attached to each publication of a research unit. Subsequently, these publications are aggregated for each CI subfield, and output and impact indicators are computed separately for these aggregates. The purpose of this procedure is to show how frequently a unit has published papers in various subfields of science, what the impact of the unit is in its main subfield(s), and how the impact of the unit in its main subfields of science compares to its impact in (for the unit) more peripheral subfields of science.

For a description of the (sub)fields see:

http://scientific.thomson.com/mjl/scope/scope_scie.html

http://scientific.thomson.com/mjl/scope/scope_ssci.html

http://scientific.thomson.com/mjl/scope/scope_ahci.html

If a paper appears in a journal that is classified in more than one subfield, the paper (and its citations) is distributed over the subfields. Thus, a paper with 7 citations published in a journal categorized in three subfields is counted as 0.33 publication with 2.33 citations in each subfield.

For publications in each subfield, the impact is compared to the world subfield average score (FCS_m), as described in Chapter 30.2.2. At the subfield level, relatively low numbers of publications prevent frequent use of statistical tests. As an indication, if the ratio CPP/FCS_m is lower than 0.8, the impact is said to be 'low', if the ratio is higher than 1.2, the impact is designated as 'high', while a ratio between 0.8 and 1.2 is called 'average'.

30.2.4 Indicators for scientific collaboration

Indicators for scientific collaboration are based on an analysis of all addresses in papers published by a research unit. Each paper is classified in one of three

categories. First, we identified all papers authored by scientists from one research unit only. These papers are classified as *'no collaboration'* or *'single institute'*, as they involve no collaboration or only 'local' collaboration. The remaining papers are classified as *'national collaboration'* when all addresses on a paper are from one country only. Finally, papers containing addresses from at least two *different countries* are assigned to the collaboration type *'international'*. For example, if a paper is the result of collaboration with both another Swedish institution and an institute outside Sweden, it is marked as 'international'. Papers in each of the three categories are aggregated for each research unit, and for each of these aggregated sets, impact and output indicators are computed. The purpose of this analysis is to show (1) how frequently a research unit has copublished papers with other research units, and (2) how the impact of papers resulting from national or international collaboration compares to the impact of papers authored by scientists from one research unit only.

For publications in each collaboration category, the citation impact is compared to the world subfield average (FCSm), as described in Chapter 30.2.2. At this level of aggregation, relatively low numbers of publications prevent frequent use of statistical tests. As an indication, if the ratio CPP/FCSm is lower than 0.8, the impact is said to be 'low', if the ratio is higher than 1.2, the impact is designated as 'high', while a ratio between 0.8 and 1.2 is called 'average'.

30.2.5 Knowledge users of UU papers

Who is using UU results, and where are these users located? To answer these questions, an 'impact profile' is calculated for UU. An impact profile is a break-down of the publications citing UU papers into subfields of science (see Chapter 30.2.3). This 'impact profile' is made in analogy to the cognitive orientation profiles discussed in Chapter 30.2.3. In the cognitive orientation profiles, the output of UU is categorized in subfields, whereas the impact profiles focus on the subfields of the users citing the UU output. This offers insight into knowledge diffusion as well as knowledge use, and the analysis may identify interdisciplinary 'bridges', potential for collaboration, and potential 'markets' for applied research.

30.2.6 Overview of bibliometric indicators

P The number of articles (normal articles, letters, notes and reviews) published in journals processed for the Web of Science (CI) versions of the Science Citation Index, the Social Science Citation Index, the Arts and Humanities Citation Index (see Chapter 30.2.1).

- C** The number of citations recorded in CI journals (as contained in Web of Science CI version) to all articles involved. Self-citations are excluded.
- C+sc** The number of citations recorded in CI journals to all articles involved, including selfcitations.
- CPP** The average number of citations per publication. Self-citations are not included.
- Pnc** The percentage of articles not cited during the time period considered, excluding selfcitations.
- JCSm** Reference value. The average citation rate of all articles published in the journals in which a research unit has published (the research unit's journal set). Self-citations are excluded.
- FCSm** Reference value. The average citation rate of all articles in the subfields in which the research unit is active. Also indicated as the world citation average in those subfields or 'world subfield average'. Subfields are defined by means of CI subject categories. Self-citations are excluded.
- CPP/JCSm** The impact of a research unit's articles, compared to the average citation rate of the research unit's journal set. A '+' ('-') symbol immediately after the numerical value indicates that the impact of the research unit's articles is significantly above (below) the average citation rate of the journal set.
- CPP/FCSm** The impact of a research unit's articles, compared to the world citation average in the subfields in which the research unit is active. A '+' ('-') symbol directly after the numerical value indicates that the impact of the research unit's articles is significantly above (below) world (subfield) average.
- JCSm/FCSm** The impact of the journals in which a research unit has published (the research unit's journal set), compared to the world citation average in the subfields covered by these journals.
- % Self-Citations** The percentage of self-citations. A self-citation is defined as a citation in which the citing and the cited paper have at least one author in common (either a first author or a secondary author).
- P02-03** Number of papers (normal articles and reviews) published in journals processed for the Web of Science version of ISI Citation Indices (CI) in the period 2002 - 2003.
- Ptop** The absolute number of papers that are among the 10% most frequently cited of all similar papers in the period 2002 - 2003.

E (Ptop) Reference value. Represents the expected number of papers among the top 10%, based on the number of papers published by the research unit in the period 2002 - 2003.

A/E (Ptop) Indicates the relative contribution of a unit to the upper percentiles of the citation distribution in the period 2002 - 2003. $A/E (Ptop)$ is equal to $Ptop / E (Ptop)$.

30.3 Data collection

30.3.1 Levels of aggregation and time periods

Indicators are computed at the following levels of aggregation of Uppsala University scientists:

- a. the total collection of all articles published by the UU scientists involved in the study (UU);
- b. Faculties/Institutes; and
- c. Departments/Centres.

Double occurrences of papers are excluded within each unit of analysis. So, one paper, labeled to two or more different research units, is counted only once on a higher level of aggregation. Similarly, a paper, co-authored by several scientists belonging to the same unit, is counted only once.

The bibliometric analysis relates to journal articles published during the period 2002 - 2006. Actually, these are 'database' years: papers are included for the year in which the Citation Indices processed them. Due to a time lag in processing articles, at one end, late papers from 2001 are included, while at the other end late papers from 2006 are not included. Data on more recent articles were not available during the data collection period of this study. Apart from an overall analysis of the impact data for the whole period, we also conducted an analysis of the main indicators across four-year periods at the level of faculties.

30.3.2 Data collection

CI papers

For the research performance analysis, a list of UU publications covering 2002 - 2006 was used that was derived from the Online Publication database of the University of Uppsala (OPUS). In addition, publication data were extracted from the UU selfevaluation reports that were prepared for the current research assessment exercise. The analysis relates to the publication output of scientists affiliated with UU in September 2006. Here, all their CI papers, irrespective of address, were included for the period 2002 - 2006. The names of scientists employed as of September 2006 were provided by Uppsala University. The bibliometric analysis relates to papers published by these scientists during the

period 2002 - 2006 (the most recently available five-year period at the start of the data collection round). Actually, these are 'database' years: papers are included for the year in which they were processed by the Citation Indices on the Web of Science. Due to a time lag in processing articles, at one end, late papers from 2001 are included, while at the other end late papers from 2006 are not included. Complete data on more recent articles were not available during the data collection period of this study.

For each scientist, all relevant publications from the database years 2002 - 2006 were extracted from our CI publication database. This includes all publications listing the researcher as *n*th co-author. We considered only papers classified in the CI as *normal articles*, *letters*, *notes*, and *reviews*, published in source serials processed for the CI on Web of Science (WoS). Other document types, such as meeting abstracts, 'editorials', 'editorial material', corrections, comments, and book reviews were *not* included. Also, papers in non-CI source journals are not counted. A few journals are only partially processed for the CI. Here, only papers processed for the CI were included.

Data collection

As mentioned above, the analysis was based on lists of publications. **Table 30.1** shows the number of UU publications and their classification as either WoS journal articles or non- WoS publications. WoS articles, letters, notes and reviews (not book reviews) are included under 'regular'; other contributions that are not included in the citation study such as book reviews, corrections, and so on are listed under 'Non-Citeable' (cf. Chapter 30.3.2); and, finally, WoS items too recent to be included are shown under 'CDyear 2007'. Non-WoS items include contributions to non-WoS journals (regular journal articles, review articles and book reviews), conference papers; chapters, books, theses (doctorate or licentiate), patents, and other publications. To be complete, editorial activities leading to published edited volumes ('Coll (ed.)') and to published volumes of proceedings ('Proc (ed.)') have also been included.

Table 30.1 shows that by far the most important category for Uppsala University and most faculties/institutes is constituted by WoS regular journal articles. Exceptions are the Arts, Educational Sciences, Languages, the Social Sciences and Theology, where non- WoS journal articles and chapters in published edited volumes are more important outlets. In Mathematics and Computer Science, the volume of conference papers is somewhat larger than that of WoS regular journal articles, while reports constitute an additional important category.

Names of UU researchers were matched with both the OPUS database and with publications from the UU self-evaluation round. As a result, we hope to have obtained valid CI publication data for most, if not all, UU researchers in this study.

Table 30.1: Publication types for Uppsala University and Institutes 2002 - 2006

| Research Unit | WoS | | | Journal articles | | | Conf. papers | | | Chapters | | | Non-WoS | | | Patent | Other | Coll (ed.) | Proc (ed.) |
|----------------------------------|---------|--------------|-------------|------------------|--------|-------------|--------------|---------|----------|---------------------|------|--------|---------|-------|-----|--------|-------|------------|------------|
| | WoS | | C/year 2007 | Journal articles | | Book Review | Conf. papers | | Chapters | Thesis ¹ | | Report | Non-WoS | | | | | | |
| | Regular | Non Citeable | | Regular | Review | | Book Review | Regular | | Review | Doct | | Lic | Books | Lic | | | | |
| Uppsala | 8,499 | 270 | 4 | 2,845 | 56 | 474 | 2,773 | 2,260 | 381 | 291 | 102 | 826 | 49 | 344 | 15 | 42 | | | |
| Arts | 61 | 16 | - | 492 | 14 | 168 | 106 | 416 | 65 | 34 | 2 | 36 | - | 34 | 3 | - | | | |
| Biology | 1,265 | 38 | 1 | 116 | 2 | 5 | 88 | 57 | 5 | 28 | 6 | 20 | 4 | 10 | - | 1 | | | |
| Chemistry | 911 | 17 | - | 38 | 2 | 5 | 95 | 26 | 1 | 9 | 5 | 3 | 2 | 2 | 1 | - | | | |
| Earth Sciences | 340 | 27 | 2 | 92 | 1 | - | 226 | 52 | 1 | 6 | 4 | 26 | - | 17 | - | - | | | |
| Educational Sciences | 8 | - | - | 52 | - | 8 | 57 | 57 | 11 | 13 | - | 22 | - | 12 | - | - | | | |
| Engineering | 619 | 12 | - | 56 | 1 | 1 | 528 | 16 | 4 | 17 | 14 | 12 | 13 | 10 | - | 13 | | | |
| Languages | 23 | 21 | - | 383 | 6 | 67 | 142 | 285 | 30 | 17 | - | 18 | - | 52 | - | 2 | | | |
| Mathematics and Computer Science | 453 | 8 | 1 | 142 | - | 1 | 521 | 45 | 21 | 7 | 36 | 318 | 32 | 13 | 2 | 3 | | | |
| Medicine | 3,554 | 88 | - | 510 | 12 | 35 | 100 | 218 | 22 | 58 | 10 | 9 | 1 | 47 | - | - | | | |
| Pharmacy | 762 | 6 | - | 52 | - | 1 | 21 | 36 | 5 | 9 | 3 | 1 | 4 | 6 | - | - | | | |
| Physics | 1,057 | 11 | - | 127 | 10 | 3 | 472 | 23 | 15 | 8 | 13 | 35 | - | 7 | - | 21 | | | |
| Social Sciences | 380 | 33 | - | 698 | 5 | 61 | 574 | 819 | 165 | 78 | 10 | 347 | - | 123 | 9 | 3 | | | |
| Theology | 5 | 2 | - | 169 | 3 | 123 | 10 | 230 | 40 | 11 | 1 | 4 | - | 16 | - | - | | | |

¹The numbers for Ph.D. and Lic theses in the table only account for theses by individuals who were employed at Uppsala University in September 2006, which is the general requirement for this study and applies to all publications. The total number of PhD theses 2002-2004 is 1,914.

Coverage of CI Publications in UU references

CI coverage of UU publications (2002 – 2006) has been estimated in three ways. **Table 30.2** includes two of these, both focusing on UU output. First, the *'Total paper coverage'* shows the percentage of UU WoS regular journal contributions among UU total papers (in journals (regular and review articles), proceedings, and books (chapters)). For Uppsala University, the majority of the paper output is covered (52%). However, this figure averages well above 80% for the faculties of Biology, Chemistry, Medicine, and Pharmacy, above 50% in Physics (63%) and Engineering (51%), just below 50% for Earth Sciences, 39% in Mathematics and Computer Science, but below 20% in Arts, Educational Sciences, Languages, Social Sciences, and Theology. At the departmental level, both the Department of Mathematics (61%) and the Department of Psychology (53%) exceed their faculty average considerably.

A second measure of CI coverage focuses on the percentage of UU journal articles that WoS covers. WoS covers only papers in serials. The CI coverage of UU journal articles (*Journal Coverage*) amounts to 75% for UU. Again, there is considerable variation at the level of faculties. CI coverage of journal articles is poor (<20%) in Arts, Educational Sciences, Languages, and Theology. In the Social Sciences, the average is 35%, but varies between 0% (Department of Economic History) to 80% (Department of Psychology). However, for all other faculties, CI journal article coverage varies between 76% (Mathematics and Computer Sciences) and 96% (Chemistry).

A third measure of CI coverage does not focus on output, but on citation impact. To gain insight in the CI coverage of UU publications, we studied the references of the UU CI papers included in the present study. To this end, references in the UU CI papers (2002 - 2006) were matched with our extended CI publication database (1980 - 2006). In this way, we can estimate the importance of CI publications to UU researchers by determining to what extent they themselves cite CI Web of Science papers, and to what extent other, non-CI, documents. Due to the extension of our database, we could only trace references dated between 1980 and 2006. Self-citations were included, as we could not exclude all self-citations for non-CI documents. Data were also collected at the level of faculties and research departments.

Table 30.2: External coverage for Uppsala papers 2002 - 2006

| Research Unit | Wos papers | Journal Papers | Journal Coverage | Total papers (in journals, procs, books) | Total paper Coverage |
|--|------------|----------------|------------------|--|----------------------|
| Uppsala | 8,502 | 11,403 | 75% | 16,436 | 52% |
| Arts | 61 | 567 | 11% | 1,089 | 6% |
| Centre for Gender Research | 17 | 37 | 46% | 77 | 22% |
| Centre for Multiethnic Research | 1 | 12 | 8% | 43 | 2% |
| Dep of ALM (Archives, Libraries, Museums) | 3 | 20 | 15% | 43 | 7% |
| Dep of Archeology and Ancient History | 5 | 67 | 7% | 142 | 4% |
| Dep of Art History | 1 | 12 | 8% | 34 | 3% |
| Dep of Cultural Anthropology and Ethnology | 6 | 94 | 6% | 151 | 4% |
| Dep of History | 9 | 72 | 13% | 152 | 6% |
| Dep of History of Science and Ideas | 5 | 77 | 6% | 120 | 4% |
| Dep of Literature | 3 | 140 | 2% | 242 | 1% |
| Dep of Musicology | 1 | 7 | 14% | 18 | 6% |
| Dep of Philosophy | 10 | 29 | 34% | 67 | 15% |
| The Uppsala Progr for Holocaust and Genocide Studies | 1 | 4 | 25% | 9 | 11% |

Continued on next page...

Table 30.2 – Continued

| Research Unit | Wos papers | Journal Papers | Journal Coverage | Total papers (in journals, procs, books) | Total paper Coverage |
|--|------------|----------------|------------------|--|----------------------|
| Biology | 1,265 | 1,383 | 91% | 1,528 | 83% |
| Dep of Bioorganic Chemistry | 32 | 39 | 82% | 39 | 82% |
| Dep of Cell and Molecular Biology | 322 | 345 | 93% | 366 | 88% |
| Dep of Ecology and Evolution | 390 | 419 | 93% | 441 | 88% |
| Dep of Evolution, Genomics and Systematics | 275 | 307 | 90% | 353 | 78% |
| Dep of Physiology and Developmental Biology | 234 | 260 | 90% | 320 | 73% |
| The Linnaeus Centre for Bioinformatics | 44 | 45 | 98% | 51 | 86% |
| Chemistry | 911 | 951 | 96% | 1,072 | 85% |
| Dep of Biochemistry and Organic Chemistry | 201 | 216 | 93% | 223 | 90% |
| Dep of Materials Chemistry | 316 | 328 | 96% | 410 | 77% |
| Dep of Photo Chemistry and Molecular Science | 65 | 66 | 98% | 69 | 94% |
| Dep of Physical and Analytical Chemistry | 372 | 384 | 97% | 422 | 88% |
| Earth Sciences | 340 | 433 | 79% | 711 | 48% |
| Educational Sciences | 8 | 60 | 13% | 174 | 5% |
| Engineering | 622 | 679 | 92% | 1,223 | 51% |
| Languages | 23 | 412 | 6% | 839 | 3% |
| Dep of English | 12 | 37 | 32% | 70 | 17% |
| Dep of Linguistics and Philology | 4 | 66 | 6% | 200 | 2% |
| Dep of Modern Languages | 7 | 84 | 8% | 173 | 4% |
| Dep of Scandinavian Languages | - | 233 | 0% | 412 | 0% |

Continued on next page...

Table 30.2 – Continued

| Research Unit | Wos papers | Journal Papers | Journal Coverage | Total papers (in journals, procs, books) | Total paper Coverage |
|--|------------|----------------|------------------|--|----------------------|
| Mathematics and Computer Science | | | | | |
| Centre for Image Analysis | 453 | 595 | 76% | 1,161 | 39% |
| Dep of Information Technology | 22 | 27 | 81% | 124 | 18% |
| Dep of Mathematics | 265 | 324 | 82% | 783 | 34% |
| | 167 | 248 | 67% | 275 | 61% |
| Medicine | 3,556 | 4,078 | 87% | 4,396 | 81% |
| Dep of Genetics and Pathology | 535 | 564 | 95% | 608 | 88% |
| Dep of Medical Biochemistry and Microbiology | 509 | 537 | 95% | 554 | 92% |
| Dep of Medical Cell Biology | 253 | 282 | 90% | 293 | 86% |
| Dep of Medical Sciences | 975 | 1,104 | 88% | 1,193 | 82% |
| Dep of Neuroscience | 490 | 552 | 89% | 608 | 81% |
| Dep of Oncology, Radiology and Clinical Immunology | 524 | 562 | 93% | 578 | 91% |
| Dep of Public Health and Caring Sciences | 372 | 491 | 76% | 532 | 70% |
| Dep of Surgical Sciences | 443 | 556 | 80% | 607 | 73% |
| Dep of Women's and Children's Health | 196 | 241 | 81% | 250 | 78% |

Continued on next page...

Table 30.2 – Continued

| Research Unit | Wos papers | Journal Papers | Journal Coverage | Total papers (in journals, procs, books) | Total paper Coverage |
|-------------------------------------|--------------|----------------|------------------|--|----------------------|
| Pharmacy | 763 | 815 | 94% | 872 | 88% |
| Dep of Medical Chemistry | 168 | 178 | 94% | 191 | 88% |
| Dep of Pharmaceutical Biosciences | 357 | 371 | 96% | 394 | 91% |
| Dep of Pharmacy | 282 | 312 | 90% | 335 | 84% |
| Physics | 1,057 | 1,194 | 89% | 1,689 | 63% |
| Dep of Astronomy and Space Physics | 138 | 174 | 79% | 283 | 49% |
| Dep of Neutron Research | 68 | 74 | 92% | 195 | 35% |
| Dep of Nuclear and Particle Physics | 141 | 173 | 82% | 339 | 42% |
| Dep of Physics | 633 | 687 | 92% | 795 | 80% |
| Dep of Theoretical Physics | 89 | 99 | 90% | 107 | 83% |

Continued on next page...

Table 30.2 – Continued

| Research Unit | Wos papers | Journal Papers | Journal Coverage | Total papers (in journals, procs, books) | Total paper Coverage |
|--------------------------------------|------------|----------------|------------------|--|----------------------|
| Social Sciences | 380 | 1,083 | 35% | 2,476 | 15% |
| Dep of Business Studies | 21 | 70 | 30% | 316 | 7% |
| Dep of Domestic Sciences | 25 | 59 | 42% | 99 | 25% |
| Dep of Economic History | - | 52 | 0% | 133 | 0% |
| Dep of Economics | 41 | 93 | 44% | 131 | 31% |
| Dep of Education | 6 | 22 | 27% | 102 | 6% |
| Dep of Eurasian Studies | 9 | 139 | 6% | 211 | 4% |
| Dep of Government | 27 | 75 | 36% | 180 | 15% |
| Dep of Information Science | 31 | 48 | 65% | 109 | 28% |
| Dep of Law | 5 | 164 | 3% | 307 | 2% |
| Dep of Peace and Conflict Research | 12 | 34 | 35% | 156 | 8% |
| Dep of Psychology | 149 | 186 | 80% | 281 | 53% |
| Dep of Social and Economic Geography | 12 | 23 | 52% | 58 | 21% |
| Dep of Sociology | 15 | 54 | 28% | 170 | 9% |
| Inst for Housing and Urban Research | 31 | 74 | 42% | 242 | 13% |
| Theology | 5 | 177 | 3% | 417 | 1% |

End of Table 30.2

Table 30.3 includes the results. P 02-06 represents the number of CI WoS articles, notes, letters and reviews published between 2002 and 2006. As an illustration, we discuss the main results for UU. UU had 8,502 CI papers in 2002 - 2006. On average, 93% of the references in these papers was dated between 1980 - 2006, while 7% (the figure included in Table 30.1 under '*% Refs < 1980*') was not. Finally, 84% of the UU references could be matched to CI Web of Science papers. In general, these findings suggest that non-CI documents are of limited importance to UU researchers, as they account for a small minority (16%) of the references in their papers.

In all, for the faculties/institutes, CI coverage was below 50% only for the Educational Sciences, Languages, and Theology. CI coverage was excellent (>80%) in the faculties of Biology, Chemistry, Medicine, Pharmacy, and Physics. Furthermore, CI coverage was good (60% - 80%) in Earth Sciences, and Mathematics and Computer Science. CI coverage was moderate (50% - 59%) in both the Arts and Social Sciences, with considerable variation at the level of departments. In these faculties, non-CI documents are of some importance. CI coverage was poor elsewhere (Educational Sciences, Languages, and Theology). Here in particular, the CI publications need to be supplemented with other non-CI documents for a full monitoring of research performance. UU CI output was below 75 CI papers in these three faculties combined.

Table 30.3: Internal coverage for Uppsala papers 2002 - 2006

| Research Unit | P 02-06 | Avg Nr. Refs | % Ref <1980 | Nr. Ref >1979 | % Refs CI |
|--|------------|-----------------|----------------|------------------|--------------|
| Uppsala | 8,502 | 36.2 | 7% | 282,094 | 84% |
| Arts | 61 | 34.5 | 19% | 1,616 | 52% |
| Centre for Gender Research | 17 | 32.4 | 8% | 494 | 70% |
| Centre for Multiethnic Research | 1 | 38.0 | 29% | 24 | 0% |
| Dep of ALM (Archives, Libraries, Museums) | 3 | 21.3 | 5% | 59 | 12% |
| Dep of Archeology and Ancient History | 5 | 38.6 | 29% | 136 | 60% |
| Dep of Art History | 1 | 9.0 | 22% | 7 | 14% |
| Dep of Cultural Anthropology and Ethnology | 6 | 45.7 | 8% | 250 | 35% |
| Dep of History | 9 | 39.6 | 26% | 254 | 53% |
| Dep of History of Science and Ideas | 5 | 42.6 | 39% | 107 | 21% |
| Dep of Literature | 3 | 46.0 | 35% | 62 | 39% |
| Dep of Musicology | 1 | 38.0 | 0% | 38 | 97% |
| Dep of Philosophy | 10 | 21.0 | 12% | 170 | 60% |
| The Uppsala Progr for Holocaust and Genocide Studies | 1 | 49.0 | 29% | 35 | 23% |

Continued on next page...

Table 30.3 – Continued

| Research Unit | P 02-06 | Avg Nr. Refs | % Ref <1980 | Nr. Ref >1979 | % Refs CI |
|--|------------|-----------------|----------------|------------------|--------------|
| Biology | | | | | |
| Dep of Bioorganic Chemistry | 1,265 | 44.7 | 8% | 52,028 | 86% |
| Dep of Cell and Molecular Biology | 32 | 60.5 | 7% | 1,787 | 91% |
| Dep of Ecology and Evolution | 322 | 44.3 | 6% | 13,324 | 92% |
| Dep of Evolution, Genomics and Systematics | 390 | 46.1 | 9% | 16,322 | 80% |
| Dep of Physiology and Developmental Biology | 275 | 42.6 | 8% | 10,696 | 84% |
| The Linnaeus Centre for Bioinformatics | 234 | 44.4 | 7% | 9,620 | 90% |
| | 44 | 36.2 | 5% | 1,497 | 87% |
| Chemistry | | | | | |
| Dep of Biochemistry and Organic Chemistry | 911 | 32.4 | 8% | 26,771 | 89% |
| Dep of Materials Chemistry | 201 | 36.1 | 7% | 6,704 | 90% |
| Dep of Photo Chemistry and Molecular Science | 316 | 28.0 | 10% | 7,767 | 87% |
| Dep of Physical and Analytical Chemistry | 65 | 41.3 | 6% | 2,500 | 92% |
| | 372 | 32.8 | 7% | 11,194 | 90% |
| Earth Sciences | 340 | 43.7 | 15% | 12,486 | 63% |
| Educational Sciences | 8 | 30.8 | 21% | 195 | 27% |
| Engineering | 622 | 24.0 | 10% | 13,171 | 78% |
| Languages | | | | | |
| Dep of English | 23 | 33.7 | 30% | 507 | 25% |
| Dep of Linguistics and Philology | 12 | 34.3 | 38% | 238 | 16% |
| Dep of Modern Languages | 4 | 28.8 | 36% | 61 | 11% |
| | 7 | 35.6 | 15% | 208 | 40% |

Continued on next page...

Table 30.3 – Continued

| Research Unit | P 02-06 | Avg Nr. Refs | % Ref <1980 | Nr. Ref >1979 | % Refs CI |
|--|------------|-----------------|----------------|------------------|--------------|
| Mathematics and Computer Science | | | | | |
| Centre for Image Analysis | 453 | 22.2 | 13% | 8,640 | 60% |
| Dep of Information Technology | 22 | 28.1 | 9% | 554 | 74% |
| Dep of Mathematics | 265 | 23.2 | 8% | 5,570 | 61% |
| | 167 | 20.0 | 22% | 2,543 | 55% |
| Medicine | 3,556 | 36.8 | 4% | 125,090 | 90% |
| Dep of Genetics and Pathology | 535 | 37.5 | 3% | 19,311 | 94% |
| Dep of Medical Biochemistry and Microbiology | 509 | 38.7 | 4% | 18,798 | 94% |
| Dep of Medical Cell Biology | 253 | 39.5 | 6% | 9,420 | 95% |
| Dep of Medical Sciences | 975 | 34.7 | 4% | 32,389 | 92% |
| Dep of Neuroscience | 490 | 40.1 | 4% | 18,822 | 90% |
| Dep of Oncology, Radiology and Clinical Immunology | 524 | 35.8 | 4% | 18,043 | 91% |
| Dep of Public Health and Caring Sciences | 372 | 36.3 | 4% | 12,880 | 80% |
| Dep of Surgical Sciences | 443 | 33.7 | 6% | 14,095 | 89% |
| Dep of Women's and Children's Health | 196 | 32.5 | 4% | 6,069 | 81% |
| Pharmacy | 763 | 36.8 | 6% | 26,299 | 89% |
| Dep of Medical Chemistry | 168 | 37.3 | 6% | 5,818 | 90% |
| Dep of Pharmaceutical Biosciences | 357 | 37.4 | 5% | 12,657 | 91% |
| Dep of Pharmacy | 282 | 36.0 | 6% | 9,424 | 87% |

Continued on next page...

Table 30.3 – Continued

| Research Unit | P | Avg Nr. Refs | % Ref <1980 | Nr. Ref >1979 | % Refs CI |
|--------------------------------------|----------|------------------------|-----------------------|-------------------------|---------------------|
| Physics | 1,057 | 32.2 | 10% | 29,284 | 85% |
| Dep of Astronomy and Space Physics | 138 | 47.0 | 12% | 5,700 | 80% |
| Dep of Neutron Research | 68 | 26.8 | 9% | 1,573 | 72% |
| Dep of Nuclear and Particle Physics | 141 | 29.4 | 6% | 3,620 | 83% |
| Dep of Physics | 633 | 29.0 | 12% | 15,825 | 88% |
| Dep of Theoretical Physics | 89 | 40.6 | 6% | 2,911 | 85% |
| Social Sciences | 380 | 43.7 | 9% | 15,002 | 58% |
| Dep of Business Studies | 21 | 63.2 | 10% | 1,190 | 50% |
| Dep of Domestic Sciences | 25 | 43.0 | 3% | 1,038 | 74% |
| Dep of Economics | 41 | 26.9 | 9% | 1,005 | 59% |
| Dep of Education | 6 | 57.7 | 20% | 276 | 62% |
| Dep of Eurasian Studies | 9 | 57.6 | 5% | 490 | 14% |
| Dep of Government | 27 | 53.9 | 7% | 1,294 | 33% |
| Dep of Information Science | 31 | 26.5 | 6% | 766 | 86% |
| Dep of Law | 5 | 36.6 | 15% | 156 | 62% |
| Dep of Peace and Conflict Research | 12 | 38.2 | 4% | 436 | 37% |
| Dep of Psychology | 149 | 45.1 | 10% | 5,996 | 70% |
| Dep of Social and Economic Geography | 12 | 89.3 | 6% | 1,007 | 34% |
| Dep of Sociology | 15 | 31.0 | 13% | 397 | 41% |
| Inst for Housing and Urban Research | 31 | 40.9 | 10% | 1,130 | 44% |
| Theology | 5 | 13.6 | 24% | 51 | 12% |

End of Table 30.3

30.4 Overall results

30.4.1 Aggregated publication output and impact

Table 30.4 presents the overall results of Uppsala University (UU) for the bibliometric indicators outlined in Chapter 30.2. So called ‘block indicators’ are calculated for the periods 2002 - 2006. This means that for publications from each of the publication years, citations are counted up to and including 2006. For example, a five-year citation window is used for papers published in 2002, and a three-year citation window for papers published in 2004.

Block analysis

The block analysis shows that publications of UU researchers are cited at or above the level of world reference values ($JCSm$, $FCSm$). For UU, the 8,502 publications (P) were cited 45,209 times (C) ‘externally’, i.e., by others than the authors of a publication, in 2002 - 2006 (see **Table 30.4**). Including self-citations, the impact amounted to 60,031 citations ($C+sc$). The average paper was cited 5.3 times (CPP) after exclusion of self-citations. About 34% of the papers was not cited externally (Pnc), a relatively low percentage. The impact of the UU papers is significantly above international reference levels: slightly above that of its journal set ($CPP/JCSm = 1.06$), and, even more important, well above the world subfield level ($CPP/FCSm = 1.25$). The ninth row of Table 30.4 shows that the percentage of *self-citations* (25%) for UU is not disproportionately high. UU researchers publish in journals with an impact-level that is 17% above the world-average ($JCSm/FCSm = 1.17$).

Most frequently cited publications

An analysis of the most frequently cited papers (top 5%) shows that of the articles and reviews published by UU in 2002 – 2003, 228 ($P_{top\ 5\%}$) are represented among the top 5% most frequently cited of all papers similar in publication year, document type, and subfield (cf. Table 30.4). The latter number exceeds the expected number of top 5% papers with about 43% ($A/E(P_{top\ 5\%})$). This shows that UU does not only have a high field-normalized impact ($CPP/FCSm$), but also contributes well above average to the number of highly cited (top 5%) papers.

30.4.2 Cognitive orientation

Usually, scientists publish not only in journals belonging to their specialty, but also in journals outside their field. Frequently, research is multidisciplinary. An analysis of the publication output according to CI subfields shows in which subfields research units are cited above or below the world subfield average ($FCSm$). **One should keep in mind that a CI subfield, for example ‘Ecology’, refers only to a combination of journals, and not to an institutional or departmental affiliation.** As a consequence, it is not unusual that publica-

Table 30.4: *Indicators of publication output and citation impact for Uppsala University 2002 - 2006*

| Indicator | Symbol | Score 2002 – 2006 |
|--|------------------------------|--------------------------|
| Number of publications in Web Of Science | <i>P</i> | 8,502 |
| Total number of citations received | <i>C+sc</i> | 60,031 |
| Citations received excluding self citations | <i>C</i> | 45,209 |
| Citations per publications, self citations not included | <i>CPP</i> | 5.32 |
| % Publications not cited, self citations not included | <i>Pnc</i> | 34% |
| Citations per publication compared to citation rate of journal packet (excluding self citations) | <i>CPP/JCSm</i> | 1.06+ |
| Citations per publication compared to citation rate of sub field(s) (excluding self citations) | <i>CPP/FCSm</i> | 1.25+ |
| Citation rate journal packet compared to citation rate of subfields (excluding self citations) | <i>JCSm/FCSm</i> | 1.17 |
| Percentage self citations | <i>Self Citations</i> | 25% |
| Number of papers that are highly cited in their subfield(s) (excluding self-citations) | <i>Ptop 5%</i> | 228 |
| Number of highly cited papers compared to total publication output | <i>A/E Ptop 5%</i> | 1.43 |

tions in one subfield have been contributed by members from several research units.

The main findings are as follows. First, we look at the output per subfield in 2002 - 2006 (see **Figure 30.1**). Data are included for the subfields accounting for at least 1% of the publication total. ‘Biochemistry & Molecular Biology’ is clearly the most important subfield for UU researchers in terms of output, including 6% of the publications, followed by ‘Physics, Condensed Matter’ with 4%. Two other subfields account each for nearly 4% of the publications: ‘Pharmacology & Pharmacy’ and ‘Oncology’.

In Figure 30.1, field-normalized (CPP/FCSm) scores are shown between parentheses behind each subfield. The impact of UU researchers is competitive with the world average in the top output subfields ‘Biochemistry

& Molecular Biology’, ‘Physics, Condensed Matter’, and ‘Oncology’, but high in ‘Pharmacology & Pharmacy’, as well as in many of its major subfields. Impact is below average in only one subfield, and that only just. Citation impact is very high ($CPP/FCSm > 2$) in two medical subfields: ‘Cardiac & Cardiovascular Systems’ and ‘Medicine, General & Internal’.

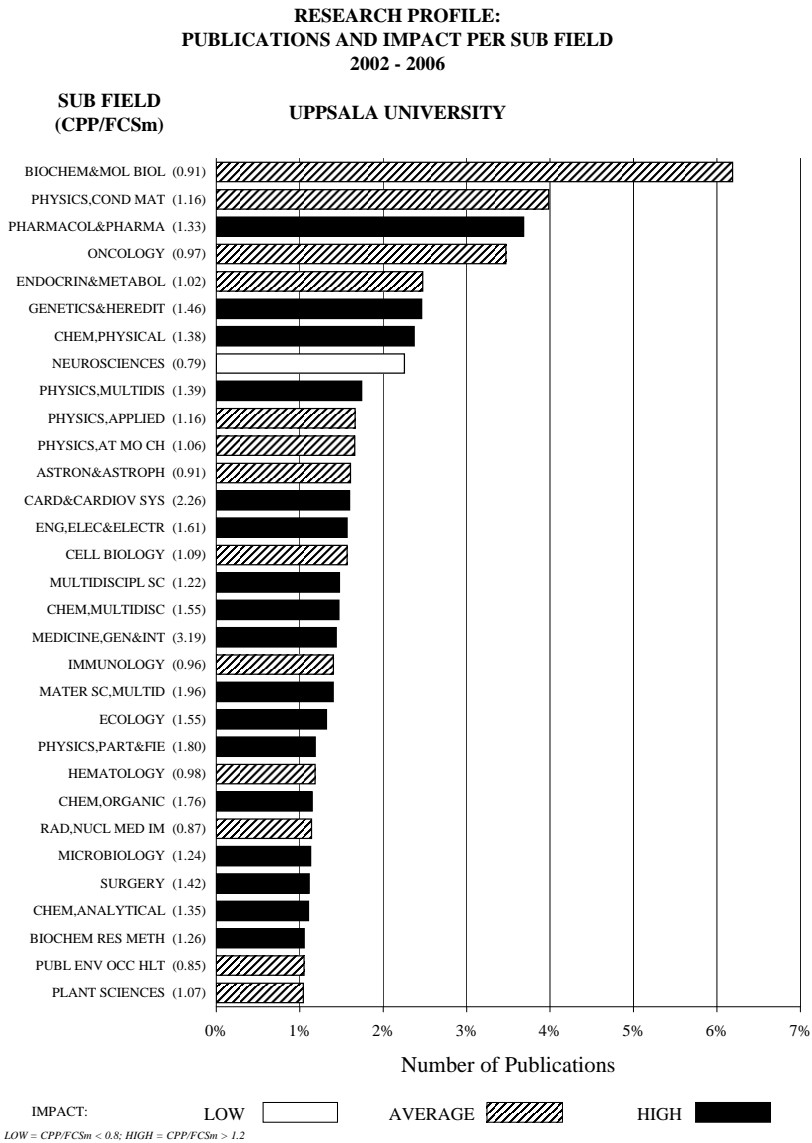


Figure 30.1: See text for details.

30.4.3 Knowledge users

To identify users of published UU knowledge, an ‘impact profile’ is calculated for UU. An impact profile is a breakdown of the publications citing UU papers. These citing publications are categorized into subfields of science (based on the CI subject categories, see Chapter 30.2.3). A citing publication is categorized only once, even if it cites more than one UU paper. Self-citations are excluded from the analysis.

Figure 30.2 presents the impact profile for UU for the period 2002 - 2006. It lists the most frequently occurring subfields of citing publications. Thus, Figure 30.2 shows that nearly 7% of the publications citing UU papers from 2002 - 2006 comes from the subfield ‘Biochemistry & Molecular Biology’, also the main UU output subfield.

The impact profile of the users of UU knowledge roughly matches the cognitive profile (see Figure 30.1) of UU output. As could be expected, the molecular biology-related subfields rank higher in the impact profile than in the UU output, because a high citation impact level characterizes them. Users come also somewhat more often from ‘Oncology’, ‘Pharmacology & Pharmacy’ and ‘Chemistry, Multidisciplinary’. Here, there is scope for collaboration and potential markets for applied research. Users from the ‘Physics, Condensed Matter’ subfield are relatively scarce. In general, the UU output seems well attuned to the needs of UU users.

Users of UU knowledge tend to be cited highly themselves. This indicates that UU work is used by researchers of high impact, at the edge of the research frontier (see Chapter 30.2.1).

Identification of users

Figure 30.3 shows the whereabouts of the thirty main users of published UU knowledge from the period 2002 - 2006. Here, Harvard University (USA) tops the list of user institutes, accounting for about 1.4% of the UU citations. For the most part, users originate from the USA (e.g., University of California at Los Angeles, Stanford), Sweden (e.g., Karolinska Institute Stockholm, UU (although self-citations were excluded)), the Peoples Republic of China, Canada (University of Toronto), the UK (e.g., University of Cambridge, University of Oxford), EU countries (Italy, Finland, Austria, Netherlands), and Japan.

Users do not only include some of the main universities worldwide, but also government institutes such as the US National Institutes of Health.

**IMPACT PROFILE:
PUBLICATIONS AND IMPACT PER SUBFIELD
KNOWLEDGE USERS
2002 - 2006**

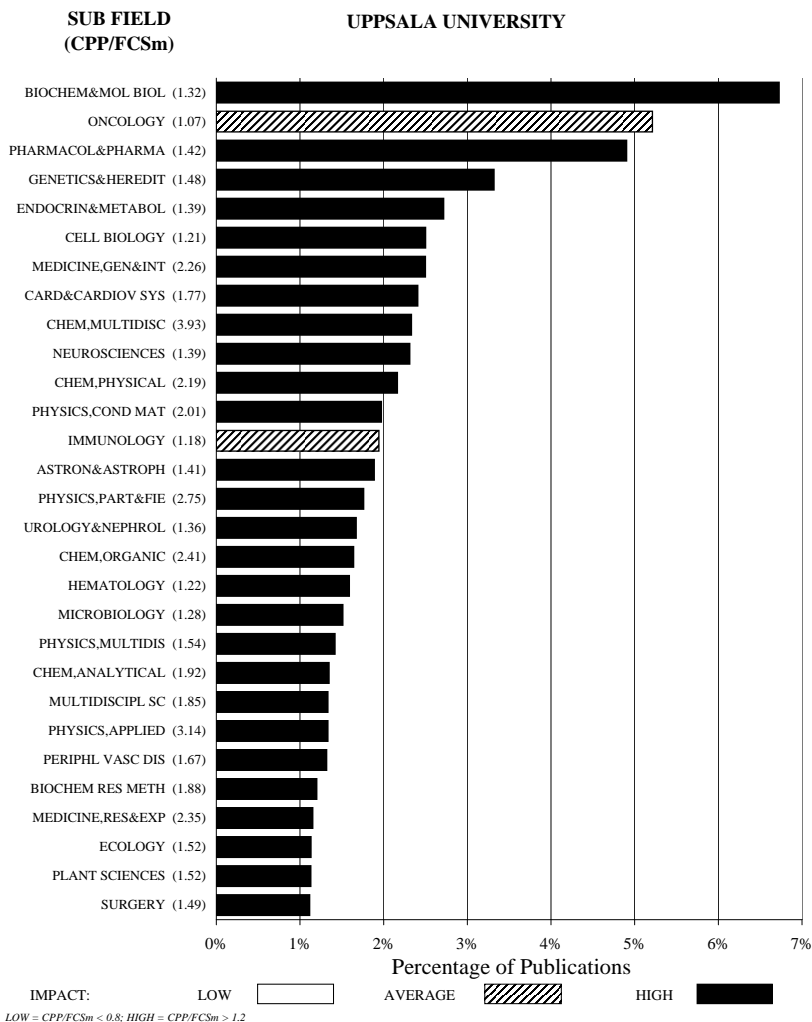


Figure 30.2: See text for details.

30.5 Indicators for faculties and research departments

30.5.1 Block indicators for faculties

We present block indicators for UU faculties/institutes during 2002 - 2006 in **Table 30.5**. Due to the small number of CI papers, detailed results have not been computed for the humanities faculties of Theology, Arts, and Languages. In general, units with less than 20 CI papers have not been included.

**THE 30 MOST IMPORTANT
UPPSALA - KNOWLEDGE USERS BY
MAIN ORGANISATION
2002 - 2006**

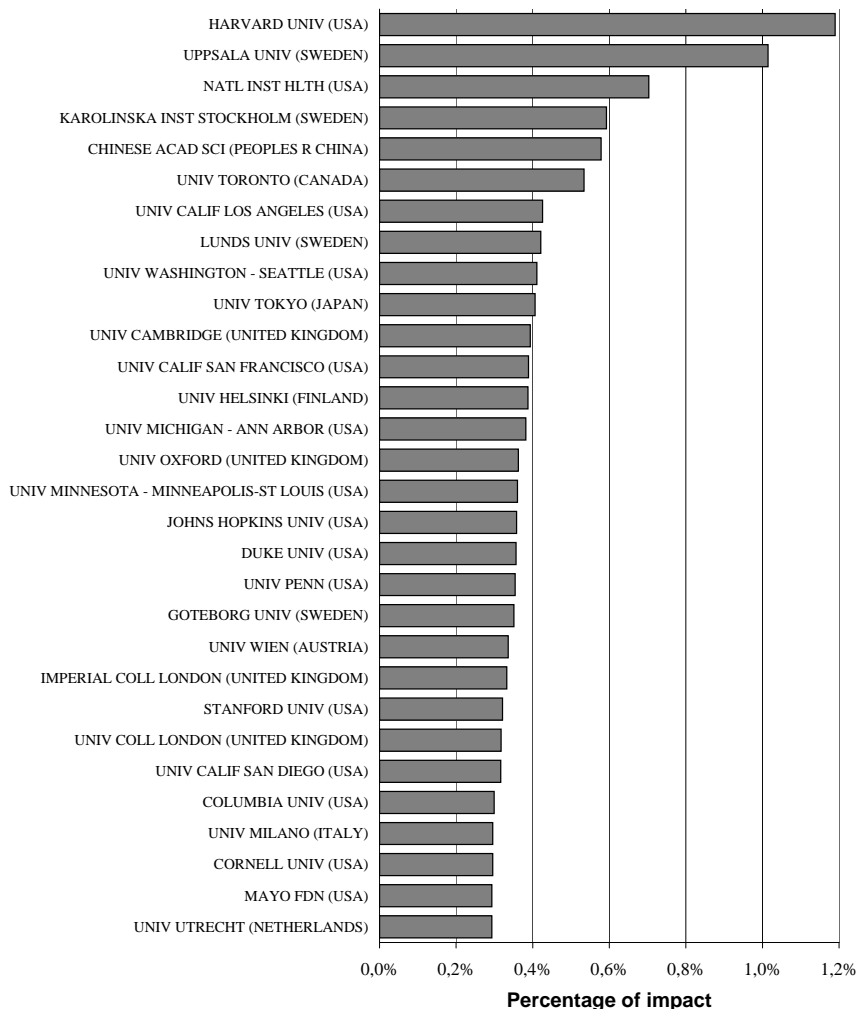


Figure 30.3: See text for details.

Focusing on the field-normalized citation impact (CPP/FCSm) during 2002 - 2006, Table 30.5 shows that the field-normalized impact of six out of nine faculties (indicated in bold) is significantly above average (17% - 36% above average). Two other faculties also have an above average impact, but not significantly so. Finally, one faculty has an impact that is competitive with the world average.

Six faculties publish in journals with an above average impact. As a result, their citation scores are closer to the average impact of their journal sets

(CPP/JCSm). Of these, only the faculty of Medicine has an impact that is slightly, but significantly above the average of its journal set, while Physics even drops significantly below the average of its high impact journals. The faculty of Social Sciences publishes in average impact journals, but its impact is a significant 25% above the average of articles in those journals. Similarly, the faculty of Mathematics and Computer Sciences publishes in average impact journals, but exceeds the impact of papers in these journals with 17%. Finally, the faculty of Earth Sciences publishes in somewhat below average impact journals, but its impact is slightly better than the average of its journal set.

Table 30.5: Bibliometric statistics for Departments and Institutes 2002 - 2006

| Department | P | C | C+sc | CPP | Pnc | CPP/JCSm | CPP/FCSm | JCSm/FCSm | Self Citations |
|--|--------------|--------------|---------------|-------------|------------|-------------|---------------|-------------|----------------|
| Biology | 1,265 | 8,174 | 10,814 | 6.46 | 28% | 1.01 | 1.36 + | 1.35 | 24% |
| Dep of Bioorganic Chemistry | 32 | 82 | 170 | 2.56 | 34% | 0.36 - | 0.55 - | 1.54 | 52% |
| Dep of Cell and Molecular Biology | 322 | 2,183 | 2,868 | 6.78 | 21% | 0.92 | 1.22 + | 1.32 | 24% |
| Dep of Ecology and Evolution | 390 | 2,163 | 2,835 | 5.55 | 31% | 1.00 | 1.42 + | 1.41 | 24% |
| Dep of Evolution, Genomics and Systematics | 275 | 1,741 | 2,268 | 6.33 | 32% | 1.05 | 1.36 + | 1.29 | 23% |
| Dep of Physiology and Developmental Biology | 234 | 1,909 | 2,565 | 8.16 | 24% | 1.12 | 1.50 + | 1.33 | 26% |
| The Linnaeus Centre for Bioinformatics | 44 | 271 | 372 | 6.16 | 36% | 1.15 | 1.67 | 1.45 | 27% |
| Chemistry | 911 | 4,603 | 6,311 | 5.05 | 35% | 1.08 | 1.35 + | 1.25 | 27% |
| Dep of Biochemistry and Organic Chemistry | 201 | 951 | 1,229 | 4.73 | 30% | 0.91 | 0.99 | 1.09 | 23% |
| Dep of Materials Chemistry | 316 | 1,228 | 1,815 | 3.89 | 42% | 1.11 | 1.44 + | 1.30 | 32% |
| Dep of Photo Chemistry and Molecular Science | 65 | 292 | 432 | 4.49 | 35% | 1.09 | 1.41 | 1.29 | 32% |
| Dep of Physical and Analytical Chemistry | 372 | 2,266 | 3,058 | 6.09 | 31% | 1.15 | 1.53 + | 1.34 | 26% |
| Earth Sciences | 340 | 838 | 1,316 | 2.46 | 46% | 1.07 | 0.94 | 0.88 | 36% |
| Engineering | 622 | 1,847 | 2,763 | 2.97 | 49% | 1.07 | 1.35 + | 1.26 | 33% |
| Mathematics and Computer Science | 453 | 843 | 1,240 | 1.86 | 55% | 1.17 | 1.11 | 0.95 | 32% |
| Centre for Image Analysis | 22 | 59 | 81 | 2.68 | 32% | 0.84 | 0.71 | 0.85 | 27% |
| Dep of Information Technology | 265 | 589 | 868 | 2.22 | 54% | 1.22 | 1.24 | 1.01 | 32% |
| Dep of Mathematics | 167 | 195 | 291 | 1.17 | 59% | 1.13 | 0.97 | 0.86 | 33% |

Continued on next page...

Table 30.5 – Continued

| Department | P | C | C+sc | CPP | Pnc | CPP/JCSm | CPP/FCSm | JCSm/FCSm | Self Citations |
|--|--------------|---------------|---------------|-------------|------------|---------------|---------------|-------------|----------------|
| Medicine | 3,556 | 24,034 | 30,552 | 6.76 | 28% | 1.08 + | 1.22 + | 1.13 | 21% |
| Dep of Genetics and Pathology | 535 | 4,579 | 5,820 | 8.56 | 24% | 1.04 | 1.37 + | 1.31 | 21% |
| Dep of Medical Biochemistry and Microbiology | 509 | 3,623 | 4,946 | 7.12 | 23% | 0.88 - | 1.14 + | 1.30 | 27% |
| Dep of Medical Cell Biology | 253 | 1,004 | 1,467 | 3.97 | 34% | 0.70 - | 0.74 - | 1.06 | 32% |
| Dep of Medical Sciences | 975 | 7,376 | 8,981 | 7.57 | 28% | 1.20 + | 1.38 + | 1.15 | 18% |
| Dep of Neuroscience | 490 | 2,872 | 3,872 | 5.86 | 27% | 1.03 | 1.03 | 1.00 | 26% |
| Dep of Oncology, Radiology and Clinical Immunology | 524 | 3,684 | 4,771 | 7.03 | 26% | 1.14 | 1.17 + | 1.03 | 23% |
| Dep of Public Health and Caring Sciences | 372 | 1,568 | 2,030 | 4.22 | 35% | 1.03 | 0.92 | 0.89 | 23% |
| Dep of Surgical Sciences | 443 | 3,272 | 3,856 | 7.39 | 29% | 1.24 + | 1.52 + | 1.22 | 15% |
| Dep of Women's and Children's Health | 196 | 579 | 763 | 2.95 | 38% | 0.77 - | 0.74 - | 0.96 | 24% |
| Pharmacy | 763 | 3,912 | 5,379 | 5.13 | 29% | 1.05 | 1.11 | 1.06 | 27% |
| Dep of Medical Chemistry | 168 | 1,155 | 1,535 | 6.88 | 24% | 1.33 + | 1.56 + | 1.17 | 25% |
| Dep of Pharmaceutical Biosciences | 357 | 1,388 | 2,022 | 3.89 | 31% | 0.85 - | 0.81 - | 0.96 | 31% |
| Dep of Pharmacy | 282 | 1,560 | 2,078 | 5.53 | 30% | 1.11 | 1.27 + | 1.15 | 25% |
| Physics | 1,057 | 4,082 | 6,279 | 3.86 | 39% | 0.89 - | 1.17 + | 1.32 | 35% |
| Dep of Astronomy and Space Physics | 138 | 688 | 1,047 | 4.99 | 26% | 0.87 | 0.91 | 1.04 | 34% |
| Dep of Neutron Research | 68 | 63 | 232 | 0.93 | 62% | 0.34 - | 0.47 - | 1.39 | 73% |
| Dep of Nuclear and Particle Physics | 141 | 412 | 758 | 2.92 | 43% | 0.74 - | 0.85 | 1.15 | 46% |
| Dep of Physics | 633 | 1,894 | 3,011 | 2.99 | 42% | 0.78 - | 1.10 | 1.41 | 37% |
| Dep of Theoretical Physics | 89 | 1,057 | 1,293 | 11.88 | 18% | 1.52 + | 2.51 + | 1.65 | 18% |

Continued on next page...

Table 30.5 – Continued

| Department | P | C | C+sc | CPP | Pnc | CPP/JCSm | CPP/FCSm | JCSm/FCSm | Self Citations |
|-------------------------------------|------------|--------------|--------------|-------------|------------|-----------------|-----------------|------------------|-----------------------|
| Social Sciences | 380 | 1,549 | 1,948 | 4.08 | 43% | 1.25 + | 1.26 + | 1.01 | 20% |
| Dep of Business Studies | 21 | 44 | 52 | 2.10 | 62% | 0.80 | 1.23 | 1.52 | 15% |
| Dep of Domestic Sciences | 25 | 117 | 156 | 4.68 | 24% | 0.99 | 0.79 | 0.80 | 25% |
| Dep of Economics | 41 | 75 | 88 | 1.83 | 49% | 0.64 - | 0.85 | 1.34 | 15% |
| Dep of Government | 27 | 54 | 73 | 2.00 | 52% | 1.44 | 1.13 | 0.78 | 26% |
| Dep of Information Science | 31 | 347 | 411 | 11.19 | 35% | 3.61 + | 2.40 | 0.66 | 16% |
| Dep of Psychology | 149 | 549 | 737 | 3.68 | 42% | 0.96 | 0.99 | 1.03 | 26% |
| Inst for Housing and Urban Research | 31 | 67 | 89 | 2.16 | 35% | 0.92 | 1.16 | 1.26 | 25% |

End of Table 30.5

Most frequently cited publications

The analysis of the most frequently cited 2002 - 2003 papers shows that each of the nine faculties exceeds the expected number of top 5% most frequently cited papers (see **Table 30.6**).

Differences are robust for Biology, Chemistry, Engineering, Mathematics and Computer Science, and Medicine. In particular, Chemistry and Engineering do well with more than twice the expected number of top 5% papers.

All faculties contributed at least nine top 5% papers (see under Ptop 5%).

Table 30.6: *Highly cited papers for the University and faculties*

| Research Unit | P0203 | Ptop 5 | E(Ptop 5%) | A/E(Ptop 5%) |
|-------------------------------------|-------|--------|------------|--------------|
| Biology | 438 | 30 | 21.8 | 1.37 |
| Chemistry | 344 | 35 | 17.2 | 2.03 |
| Earth Sciences | 104 | 9 | 5.3 | 1.69 |
| Engineering | 186 | 20 | 9.3 | 2.15 |
| Mathematics and Computer Science | 181 | 16 | 8.9 | 1.80 |
| Medicine | 1,432 | 95 | 71.8 | 1.32 |
| Pharmacy | 308 | 17 | 15.5 | 1.10 |
| Physics | 368 | 21 | 18.2 | 1.15 |
| Social Sciences | 151 | 10 | 7.5 | 1.33 |
| Uppsala University | 3,190 | 228 | 159.5 | 1.43 |

Figure 30.4 compares the actual number of highly cited papers at the top 5% level (Ptop 5%) with the ratio between actual and expected top 5% papers (A/E Ptop 5%) for the nine largest UU faculties. An A/E Ptop 5% ratio above 1 indicates that more top 5% papers are produced than expected on the basis of output. In 2002 – 2003, all but one faculty produced between 9 and 35 top 5% papers. Only the Faculty of Medicine produced considerably more. In particular Earth Sciences and Mathematics and Computer Science did better than expected given their field-normalized citation impact scores. In general, the top 5% indicator shows that faculties do not only do well on their average field-normalized impact (CPP/FCSm), but also contribute above average to the top-end of research in their subfields.

30.5.2 A survey of output and impact results for research departments

We made an analysis of the relation between output (in terms of CI-publications) and citation impact on the level of research departments (as

**NUMBER OF HIGHLY CITED PUBLICATIONS AND
RATIO OF ACTUAL TO EXPECTED
2002 - 2003**

INSTITUTES

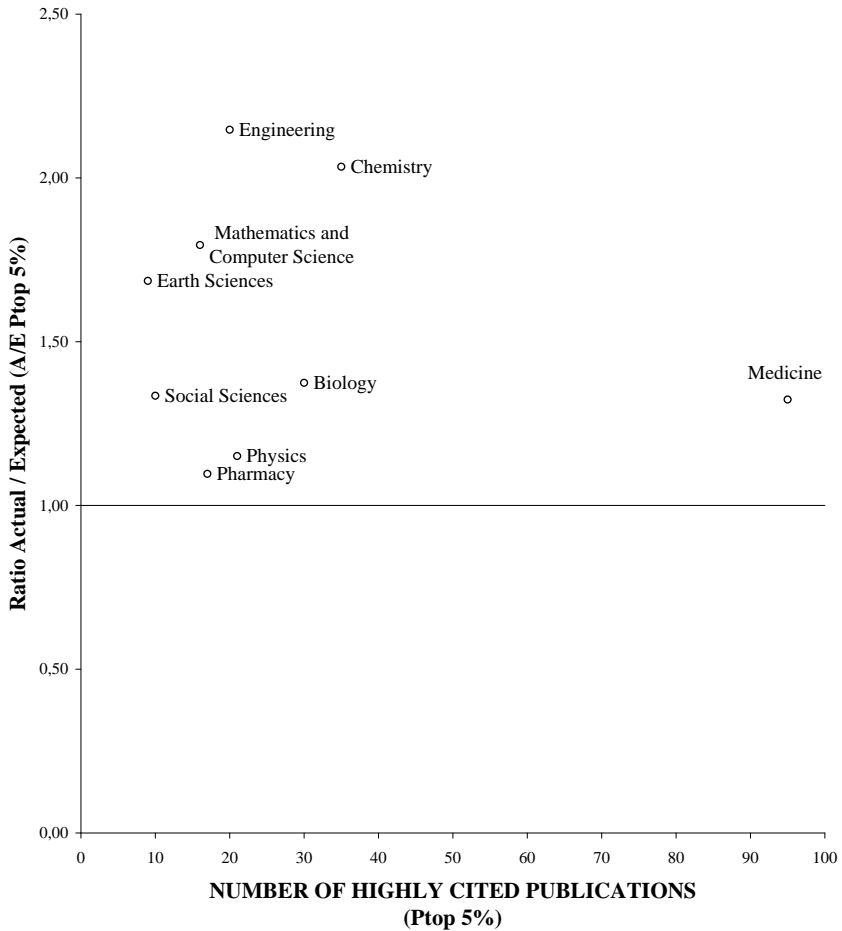


Figure 30.4: See text for details.

noted in Chapter 30.5.1, departments in Theology, Arts, and Languages are not included, nor are other units with less than 20 publications). **Figure 30.5** combines output figures (P) and field-normalized impact results (CPP/FCSm) for 2002 - 2006. Detailed findings are presented in Table 30.5.

Fifteen research departments are cited significantly above the world sub-field average (CPP/FCSm), whereas five research departments are cited significantly below average. A further five are cited at least 20% above the world subfield level, while only one other is cited at least 20% below the world sub-

field level. Nearly all of the units producing more than 400 papers are cited significantly above average.

The distribution visible in Figure 30.5 matches to some extent a well-known pattern. The pattern that we encounter frequently in our studies is that extreme citation impact scores are mainly found among the research units with a relatively low output, while the citation impact scores of the research units with the largest outputs are somewhat closer to the world subfield average. Partly, this pattern is due to the statistical fact that error tends to be larger among units with fewer observations than among those with a larger number of observations.

30.6 Indicators of scientific collaboration

Three types of scientific collaboration were distinguished (see Chapter 30.2.4). Publications with only one address were assigned to '*single group*'. Publications with multiple addresses, all from the same country, were assigned to '*national collaboration*'. Finally, all publications with at least one address outside Sweden were marked with the collaboration type '*international*'.

Figure 30.6 shows the percentage of the total output (P) represented by each of the three types of collaboration for UU and its major faculties during 2002 - 2006. It has been indicated whether the impact compared to the world subfield average (CPP/FCSm) is 'relatively low' (<0.80), 'average' (0.80 - 1.20) or 'relatively high' (>1.20).

Figure 30.6 shows the importance of collaboration for UU researchers: 'internally' produced 'single group' publications represent only about a quarter of the total output. Both national and in particular international collaboration are of considerable importance. For UU, publications stemming from international collaboration are cited highly and more often than those produced in the own institute or in national cooperation. However, Figure 30.6 shows that several faculties have somewhat divergent signatures in scientific collaboration.

The results show that UU researchers tend to contribute substantially to international scientific networks, and that many receive an important part of their impact from publications that are internationally co-authored.

30.7 General comments and discussion

A few general comments can be made on the use of bibliometric indicators for the assessment of research performance. It is our experience in previous bibliometric studies on research performance in the natural and life sciences, medicine, the humanities, and the social and behavioral sciences, that bibliometric indicators provide useful information to a peer group evaluating re-

**IMPACT COMPARED TO WORLD SUBFIELD AVERAGE
2002 - 2006**

Departments

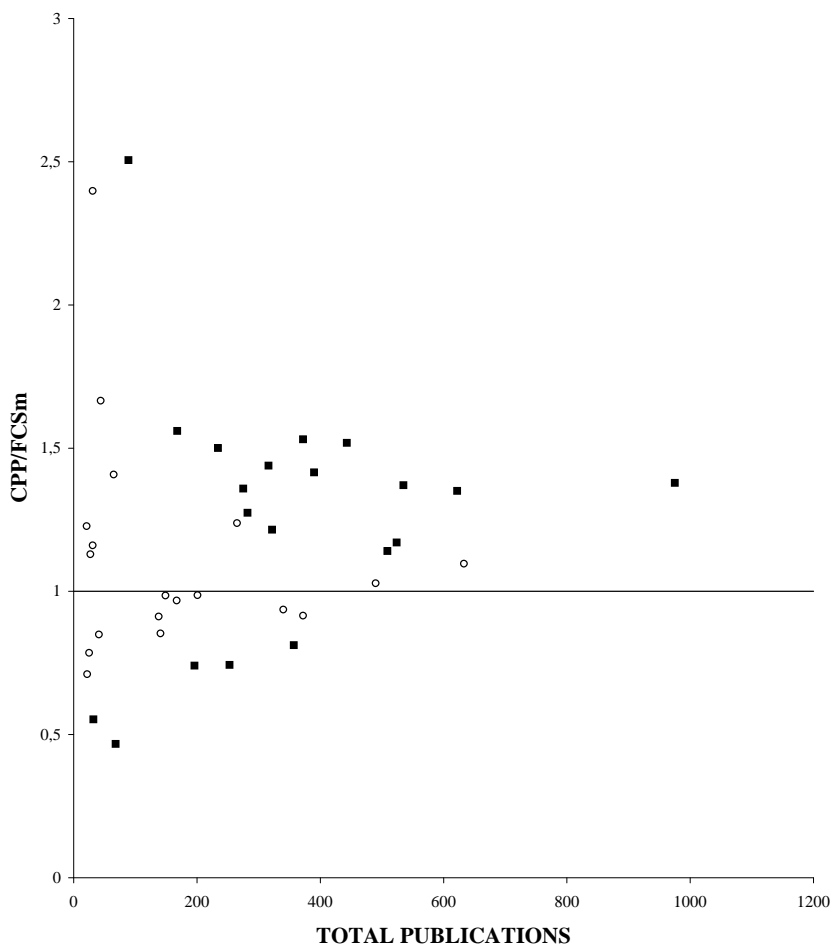


Figure 30.5: Black coloured squares above (below) the horizontal reference line represent groups for which the impact (CPP) is above (below) world average (FCSm) with statistical significance. For open circles statistical significance is not achieved.

search performance. These studies revealed a fair correspondence between the results of bibliometric analyses on the one hand, and judgements on scientific quality by peers on the other hand. In our view, a quality judgement on a research unit or institute can only be given by peers, based on a detailed insight into content and nature of the research conducted by the group or institute in question. The citation-based indicators applied in this study measure the im-

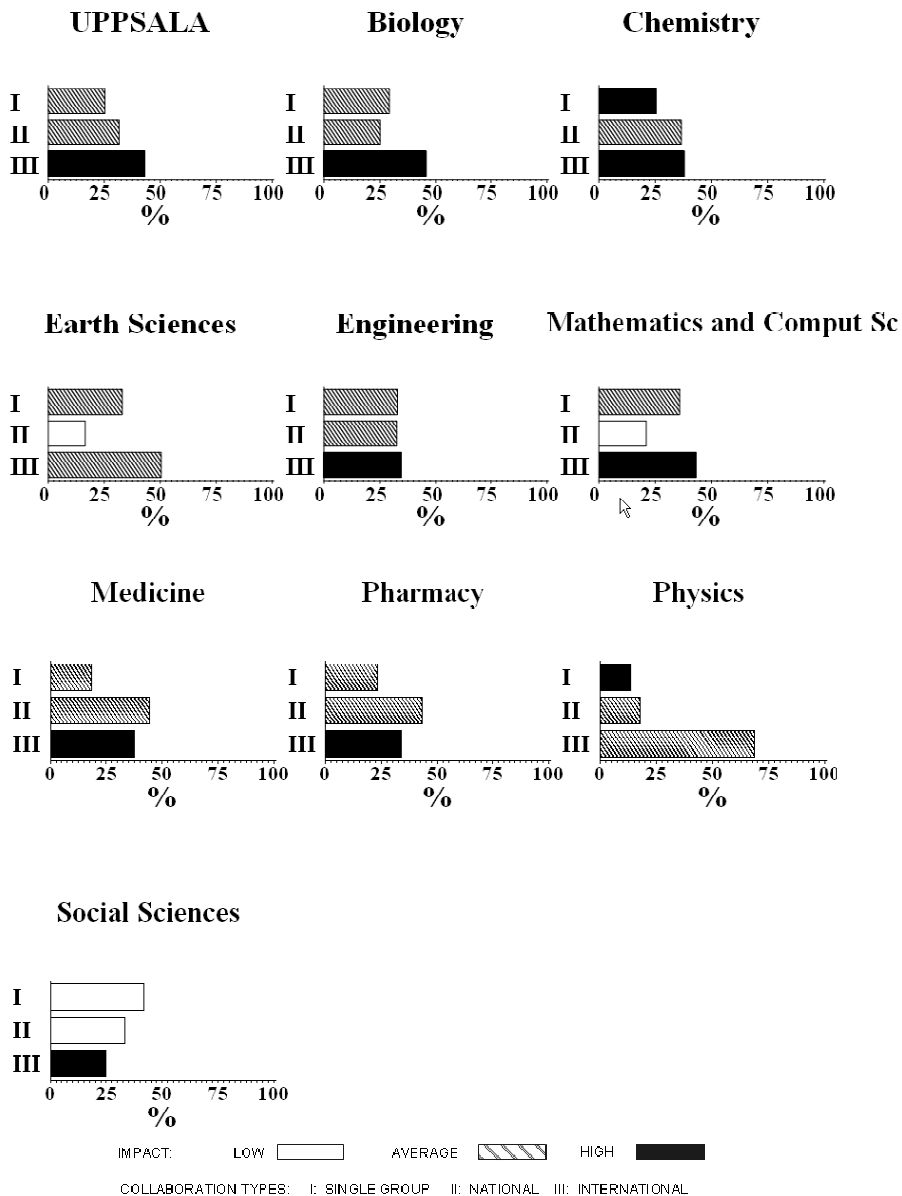


Figure 30.6: Impact analysis for types of collaboration 2002-2006 Uppsala University and Institutes.

pact at the short or middle-long term of research activities at the international research frontier, as reflected in publication and citation patterns. Impact and scientific quality are by no means identical concepts. Nor are impact and utility of research to users in society (Nederhof & Meijer, 1995).

Bibliometric indicators cannot be interpreted properly without background knowledge on both the research units or programs that are evaluated, and the

subfields in which the research units are active. In previous studies we have encountered a few cases in which a bibliometric indicator pointed in one direction (e.g., a low impact), while statements by peers or even other indicators pointed in another direction (e.g., a high quality). Analyzing such discrepancies from a bibliometric point of view, specific limitations related to the bibliometric methodology applied in the study in question may be identified. While in most cases such limitations do hardly affect the results or have no effect at all, in exceptional cases the bibliometric outcomes may provide an incomplete or even distorted picture. For instance, the classification of journals into subfields may be less appropriate for some research units, particularly when they are active in topics of a multidisciplinary nature. In particular, this latter case pertains to fast-developing novel interdisciplinary fields. Then, in the calculation of the impact compared to the world subfield citation average, this world average may not be representative for the subfield in which such a research department or institute is active. If there are strong indications that the definition of the subfield in terms of journals is inadequate, then the journal-based world average (JCSm) is more appropriate.

A second limitation concerns the coverage of the Citation Indices (CI). In specific subfields, particularly in applied or technical sciences, the CI coverage may be less adequate. For a number of research units, valuable additional information may be obtained by retrieving impact data for non-CI publications (e.g., articles in journals that are not or no longer covered by CI). In the present study, CI papers account for 84% of the references in UU papers. This provides support for the use of CI papers as the basis of a citation analysis.

Another example of a limitation of bibliometric analysis relates to time delays. It may take several years for a collection of papers to generate a high impact. We have analyzed research units that generated only a moderate impact at the time. When we updated the results after a few years, several research units showed a sharply rising impact curve.

We emphasize that our study does not represent a complete overview of the bibliometric past performance of research units. The presently used approach focuses on the publications from 2002 - 2006 (cf. Chapter 30.1). Outside these periods, significant work may have been produced that is not included in the present analyses. In the 'back-to-the-future' approach adopted in this study, all publications of researchers (including those without a UU address) have been assigned to the research unit to which they are affiliated recently, rather than the research unit to which they were previously affiliated (see Chapter 30.1), and publications were excluded of retirees and of researchers no longer present. Also, relevant work of junior scientists publishing without their mentor may not always have been included.

In the interpretation of the figures, it should be taken into account that even with a quite high number of publications, a difference of 5% should not be taken as a statistically significant result. Results involving lower levels of aggregation, such as team-leaders, are subject to a higher degree of uncertainty.

Scientists or units may have previously participated in one of our bibliometric studies. In some cases, different results are obtained. Reasons for differences between the present study and a previous one include changes in (status of) participating scientists, differences in publications that are included, and a difference in the period during which citations are collected.

30.8 Main findings and conclusions

In this study, the research performance of UU researchers during 2002 - 2006 has been compared with a number of international reference values. The citation impact of the UU papers is significantly above international reference levels: 6% above the level of its journal set, while field-normalized impact is 25% above the world average. UU researchers publish in journals with an impact-level that is 17% above the world average.

The citation impact of UU researchers is competitive with the world average in its top output subfields 'Biochemistry & Molecular Biology', 'Physics, Condensed Matter', and 'Oncology', and high in 'Pharmacology & Pharmacy', as well as in many of its other major subfields. Impact is below average in only one subfield, and that only just. Citation impact is very high in both 'Cardiac & Cardiovascular Systems' and 'Medicine, General & Internal'.

The field-normalized impact of eight faculties is above average, for six significantly so. One faculty has an impact that is competitive with the world average. Fifteen research departments are cited significantly above the world subfield average (CPP/FCSm), whereas five research departments are cited significantly below average. A further five are cited at least 20% above the world subfield level, while only one other is cited at least 20% below the world subfield level.

Among the top 5% most frequently cited papers in their subfields, UU papers occur about 43% more often than expected, and each of the nine faculties exceeds the expected number. Differences are robust for Biology, Chemistry, Engineering, Mathematics and Computer Science, and Medicine. All faculties contributed at least nine top 5% papers. These findings show that the competitive impact score of UU papers compared to the world subfield average is not due to a few exceptional papers.

UU researchers contribute substantially to international scientific networks, and many receive a sizeable part of their impact from publications that are internationally coauthored.

30.9 Statistical Test

Explanation of the significance test used by CWTS

The significance test used by CWTS is developed by W. Glänzel. This test indicates whether the impact of a research unit's publication output differs significantly from all the publications in the journal(s) or the subfields(s) in which the research unit was active.

Citations are distributed rather skew, but the average citation-scores within a distribution are approximately normally distributed. As empirical data, citation data are subject to statistical ('random') influences. Their random error (which can be determined from the number of publications and from the citation-frequency distribution) must be taken into account when citation-averages are compared with each other, or with given 'fixed' values. The standard error $d(x)$ of the mean citation-score x of a certain research unit depends on the size of the research unit and the 'inequality' of the distribution:

$$d(x) = D/\sqrt{n}$$

where n represents the number of papers published by the research unit, and D represents the standard-deviation of the citation distribution. We say that x is significantly larger / smaller than a given fixed value a at a confidence level of 95%, if $(x-a)/d(x)$ is larger than 1.96, respectively smaller than -1.96. This method can be applied in the comparison of actual (CPP) with 'expected' scores (JCSm, FCSm). Since the 'expected' scores JCSm / FCSm are based on rather large data sets, their 'random' error is much smaller than that of the value CPP, and can therefore be neglected. Thus, for comparisons the JCSm and FCSm can be treated as fixed values.

The shape of the citation frequency distribution is best represented by a *negative binomial distribution* (cf. Schubert & Glänzel, 1983). An important parameter to estimate this distribution is the percentage of uncited publications. As a consequence, it may happen that the average impact of one research unit is not significantly different from JCSm or FCSm, whereas a research unit with a lower number of publications and a lower volume of citations, but with a different percentage of uncited publications does yield a significant finding against similar JCSm or FCSm values.

Previous research at CWTS has shown that similar results are obtained by using a nonparametric statistical test. Only for small numbers of publications and citations, the Glänzel test may render a significant result where the non-parametric test is more conservative. However, the Glänzel test is robust when the number of publications and citations is not very small.

30.10 References

Garfield, E. (1979). *Citation Indexing - Its Theory and Applications in Science, Technology and Humanities*. New York: Wiley.

Martin, B.R. and Irvine, J. (1983). Assessing basic research. Some partial indicators of scientific progress in radio astronomy. *Research Policy*, 12, 61-90.

Moed, H.F., De Bruin, R.E. and Van Leeuwen, T.N. (1995). New bibliometric tools for the assessment of national research performance: Database description, overview of indicators and first applications. *Scientometrics*, 33, 381-425.

Moed, H.F. and Van Leeuwen, T.N. (1996). Impact factors can mislead. *Nature*, 381, 386.

Moed, H.F. (2005), *Citation Analysis in Research Evaluation*. Dordrecht: Springer.

Narin, F. and Whitlow, E.S. (1990). *Measurement of scientific co-operation and coauthorship in CEC-related areas of science*, Report EUR 12900, Office for Official Publications of the European Communities, Luxembourg.

Nederhof, A.J. (1988). The validity and reliability of evaluation of scholarly performance. In: A.F.J. Van Raan (ed.), *Handbook of Quantitative Studies of Science and Technology*. Amsterdam: North-Holland/Elsevier Science Publishers, pp. 193-228.

Nederhof, A.J. and Meijer, R.F. (1995). Development of bibliometric indicators for utility of research to users in society: Measurement of external knowledge transfer via publications in trade journals. *Scientometrics*, 32, 37-48.

Nederhof, A.J. & Visser, M.S. (2004). Quantitative deconstruction of citation impact indicators: Waxing field impact but waning journal impact. *Journal of Documentation*, 60 (2004), 6, 658-672.

Nederhof, A.J. (2006). Bibliometric monitoring of research performance in the social sciences and the humanities: A review. *Scientometrics*, 66, 81-100.

Nederhof, A.J. (2008). Policy impact of bibliometric rankings of research performance of departments and individuals in economics". *Scientometrics*, 74,1.

Price, D.S. (1963). *Little science, big science*. New York: Columbia University Press.

Rinia, E.J., Van Leeuwen, T.N., Van Vuren, H.G. & Van Raan, A.F.J. (2001). Influence of interdisciplinarity on peer-review and bibliometric evaluations in physics research. *Research Policy*, 30 (2001) 3, 357-361.

Schubert, A. and Glänzel, W. (1983). Statistical reliability of comparisons based on the citation impact of scientific publications. *Scientometrics*, 5, 59-74.

Schubert, A., Glänzel, W. and Braun, T. (1989). Scientometric data files. A comprehensive set of indicators on 2649 journals and 96 countries in all major science fields and subfields 1981-1985. *Scientometrics*, 16, 3-478.

Tijssen, R.J.W., Van Leeuwen, T.N., and Van Raan, A.F.J. (2002). *Mapping the scientific performance of German Medical research*. Stuttgart, New York: Schattauer.

Tijssen, R., Hollanders, H., Van Leeuwen, T. & Nederhof, A.J. (2006). *Science and Technology indicators 2005 Summary*. Netherlands Observatory of Science and Technology. Den Haag: Deltahage.

Van Leeuwen, T.N. and Moed, H.F. (2001). Development and application of new journal impact measures. *Cortex*, 37, 607-610.

Van Leeuwen, T.N., Visser, M.S., Moed, H.F., Nederhof, A.J. & Van Raan, A.F.J. (2003). The holy grail of science policy: Exploring and combining bibliometric tools in search of scientific excellence. *Scientometrics*, 57, 2, 257-280.

Van Raan, A.F.J. (1997). Advanced bibliometric methods as quantitative core of peer review based evaluation and foresight exercises. *Scientometrics*, 36, 396-420.

Part V:
Appendices

A. Distribution of departments and units on panels

Panel 1

Dept of Economics
Dept of Information Science/Statistics

Panel 2

Dept of Business Studies
Dept of Social and Economic Geography
Institute for Housing and Urban Research

Panel 3

Dept of Education
Dept of Sociology
Dept of Domestic Sciences (Food Science and Nutrition)
Faculty of Educational Sciences
Dept of Information Science/Media and Communication

Panel 4

Dept of Peace and Conflict Research
Dept of Government
Dept of Eurasian Studies

Panel 5

Dept of Psychology

Panel 6

Dept of English
Dept of Linguistics and Philology: Computational Linguistics, Linguistics, Iranian Languages, Semitic languages, Swahili, Turkic Languages
Dept of Modern Languages: Fenno-Ugric languages, German, Romance languages, Slavic Languages
Dept of Scandinavian Languages

Panel 7

Dept of Linguistics and Philology: Assyriology, Byzantine Studies, Greek, Hebrew, Indology with Comparative Indo-European Studies, Latin

Dept of English: Celtic Languages

Dept of Modern Languages: Church Slavonic

Dept of Scandinavian Languages: Early Scandinavian Languages, Old Norse, Runology, Onomastics

Dept of Archaeology and Ancient History: Egyptology

Panel 8

Dept of Philosophy

Dept of Art History

Dept of Literature

Dept of Musicology

Dept of Domestic Sciences (Textile Studies)

Centre for Gender Research

Panel 9

Dept of Archaeology and Ancient History

Dept of History

Dept of History of Science and Ideas

Dept of Economic History

Dept of Cultural Anthropology and Ethnology

Centre for Multiethnic Research

Dept of ALM (Archive, Library, Museum)

Panel 10

Dept of Law

Panel 11

Dept of Theology

Panel 12

Dept of Mathematics

Centre for Image Analysis

Dept of Information Technology/Scientific computing

The Linnaeus Centre for Bioinformatics

Panel 13

Dept of Physics

Dept of Astronomy and Space Physics

Dept of Neutron Research

Dept of Nuclear and Particle Physics

Dept of Theoretical Physics

Panel 14

Dept of Materials Chemistry

Dept of Photo Chemistry and Molecular Science

Dept of Physical and Analytical Chemistry

Dept of Biochemistry and Organic Chemistry

Panel 15

Dept of Bioorganic Chemistry
Dept of Cell and Molecular Biology
Dept of Ecology and Evolution
Dept of Evolution, Genomics and Systematics
Dept of Physiology and Developmental Biology
The Linnaeus Centre for Bioinformatics

Panel 16

Dept of Earth Sciences

Panel 17

Dept of Engineering Sciences

Panel 18

Dept of Information Technology
Dept of Information Science/Human-Computer Interaction
Dept of Information Science/Computer Science
Dept of Engineering Sciences/Signals and Systems
The Linnaeus Centre for Bioinformatics

Panel 19

Dept of Pharmaceutical Biosciences
Dept of Medicinal Chemistry
Dept of Pharmacy

Panel 20

Dept of Medical Biochemistry and Microbiology
Dept of Medical Cell Biology

Panel 21

Dept of Public Health and Caring Sciences

Panel 22

Dept of Surgical Sciences
Dept of Women's and Children's Health
Dept of Medical Sciences/Cancer Pharmacology and Informatics,
Clinical Pharmacology
Dept of Public Health and Caring Sciences/Nutrition and Metabolism
Uppsala Clinical Research Center (UCR)
Dept of Oncology, Radiology and Clinical Immunology - ORKI

Panel 23

Dept of Neuroscience
Dept of Public Health and Caring Sciences/Geriatrics

Panel 24

Dept of Genetics and Pathology
Ludwig Institute
Dept of Medical Sciences/Molecular Medicine
Dept of Medical Biochemistry and Microbiology/Tumor
Biology and Genetics

B. Evaluation package

“Quality and Renewal 2007” Research evaluation at Uppsala University

To the chairs of Uppsala University departments

The primary goal of the present evaluation is to identify strong areas of research and successful scientific constellations at Uppsala University. It is particularly important to find emerging science and future opportunities for new research. The evaluation will not compare different departments and disciplines within Uppsala University with each other. It aims at probing the standing in national and international perspectives, reflecting the quality and renewal of each department compared to that of other universities involved in the same research field.

The evaluation will provide reliable background material in the decision-making process for future strategic projects, and it will offer departments and faculties support in their work to formulate their plans for future research.

The present document is meant to form a concise but informative background material for the expert panels to aid their work in carrying out the evaluation. It is divided into three parts. The first part is a written description of research activities, opportunities for renewal and a selfassessment to be completed by the department. The second part is a quantitative summary of certain research related activities, to be completed by the department, and the third part presents data as extracted from databases.

Web-publishing is a conveniently accessed and often preferred means of communicating scientific research, and departments may want to provide relevant web addresses in order to offer additional means of obtaining information about the research activities.

The complete list of publications contained in OPUS will be made available to the expert panels on Feb. 15, 2007. Therefore, the OPUS database needs to be updated by that time. This list of publications will also be subject to a separate bibliometric analysis.

For publications included in the two different lists of papers selected by the department, and which are not available electronically (e.g. books), the department is asked to make at least two copies available to the KoF -07 project management on Feb.15, 2007.

The present method for collection of evaluation material is designed with the intention to minimize workload for the departments, still offering relevant information to the expert panels.

The project management hopes that the department will find the information collection process reasonable and adequate.

Uppsala 1 Dec. 2006

Prof. Joseph Nordgren
Project Manager, KoF -07

Evaluation document, KoF -07

To be completed (in English) by the Department/Unit and uploaded on the KoF -07 portal **by Thursday Feb 15, 2007**. Use this document (template) and submit one aggregated document per department. The evaluation document will be available, as it is submitted, to the external expert panels immediately after this.

The document consists of three sections:

- A. A written description of research activities, renewal etc., to be completed by the department
- B. A quantitative summary of certain research related activities, to be completed by the department
- C. Certain basic data extracted from the common databases, for the information of the department and with the possibility to make comments upon. A separate document is available on the project portal (www.uadm.uu.se/kof) describing the data sources and selection in detail.

Part A: Strategic aspects on research

Name of the department:

A1. Give a summary of research activities

Clarification: The research profile should be clear from this summary. Other aspects to consider are multi- and interdisciplinary activities, important infrastructure etc.

Limitation: All departments are allowed to submit a summary of at least 2,000 characters incl. spaces. The maximum size allowed for the summary depends on the number of (full-time equivalent) research-active staff at the department. The maximum size for each department can be found in part C of this document, the enclosed data from common databases (first page under Personnel, the line “Max characters (Q A1-3)”). The maximum size applies to each of the sections A1, A2, and A3.

A2. Describe currently active particularly successful research areas and groups/networks, in a national or international perspective. List actions that would further improve the quality of the department’s research in general.

Limitation: All departments are allowed to submit at least 2,000 characters incl. spaces. The maximum size allowed depends on the number of (full-time equivalent) research-active staff at the department. The maximum size for each department can be found in part C of this document, the enclosed data from common databases (first page under Personnel, the line “Max characters (Q A1-3)”). The maximum size applies to each of the sections A1, A2, and A3.

A3. Describe the most promising future research directions for the department. Comment upon the conditions to develop new directions of research.

Limitation: All departments are allowed to submit at least 2,000 characters incl. spaces. The maximum size allowed depends on the number of (full-time equivalent) research-active staff at the department. The maximum size for each department can be found in part C of this document, the enclosed data from common databases (first page under Personnel, the line “Max characters (Q A1-3)”). The maximum size applies to each of the sections A1, A2, and A3.

A4. Select and present a list of publications representing the research activity at the department (from any year)

Clarification: Selected publications could be written in English, or other language which is commonly used in the research field in question. If the publication is electronically available, include a link. For publications that are not available electronically (e.g. books), the department is asked to provide at

least 2 copies for the panel members. All selected publications should also be available in print during the expert panel visit.

Limitation: All departments are allowed to list at least two (2) publications. The maximum number of publications to be listed depends on the number of (full-time equivalent) research-active staff at the department. The maximum number of publications for each department can be found in part C of this document, the enclosed data from common databases (first page under Personnel, the line “Max no of publ (Q A4)”).

A5. Select and present a list of publications representing renewal of research activity at the department (from any year)

Clarification: Selected publications could be written in English, or other language which is commonly used in the research field in question. Publications in press could also be included. If the publication is electronically available, include a link. For publications that are not available electronically (e.g. books), the department is asked to provide at least 2 copies for the panel members. All selected publications should also be available in print during the expert panel visit.

Limitation: All departments are allowed to list at least one (1) publication. The maximum number of publications to be listed depends on the number of (full-time equivalent) research-active staff at the department. The maximum number of publications for each department can be found in part C of this document, the enclosed data from common databases (first page under Personnel, the line “Max no of publ (Q A5)”).

A6. Present a list of publications not included in the OPUS database (optional)

Clarification: All publications should be registered in OPUS by Feb 15, to be accessed by the external experts and for the separate bibliometric analysis. In the case that a researcher has moved to Uppsala University within the last years, there could be vital publications contributing to the research but not registered in OPUS. A list of these publications from 2002-2006 could be added here, formatted according to “svensk standard” (see examples from OPUS). This additional list will also be available to the external experts, and to the bibliometric analysis.

A7. Present a list of significant prizes and awards

Clarification: List the person, age (when receiving award), sex, year and award. Include prizes/awards presented to individual researchers or to groups/department since 2003. Only international or significant national prizes should be listed.

A8. Additional sources of information

Clarification: In order for the external experts to get a complete and correct picture of the department, please list additional sources of information, such as website addresses for the department and research/research groups (if applicable). If information is only available in Swedish, clearly state this after the address in question.

Part B: Quantitative summary of research activities

Clarification: In the tables **total numbers** for the department should be presented (not detailed lists). *During the visits the experts might ask for more detailed explanations regarding the numbers presented.*

An Excel-template for all questions below can be found in the KoF-portal, for distribution within the department.

B1. Engagement and involvement in the scientific society (since 2003)

| | Total number | Number of individuals contributing |
|--|--------------|------------------------------------|
| Plenary or keynote talks at international conferences | | |
| Invited talks at international conferences | | |
| Assignment in research councils and foundations | | |
| Assignment as expert at evaluations for professor and lecturer positions | | |
| Assignment as editor or member of editorial boards | | |
| Member of international scientific councils | | |
| Member of academies and learned societies | | |
| Other, specify (e.g. hosting of major conferences, etc.): | | |

B2. Actions for renewal (since 2003)

| | Total number |
|--|--------------|
| External recruitments (with doctoral exam from another university) | |
| Internal recruitments (with doctoral exam from Uppsala University) | |
| Number of granted external funds for new projects | |
| Other, specify: | |

B3. International collaboration (since 2003)

| | Total number |
|---|--------------|
| Research visits abroad (of at least 3 months duration) | |
| Visiting researchers (of at least 3 months duration) | |
| Number of collaborating institutions with joint publications | |
| Other activity according to traditions of the research field (specify; scientific expeditions, field work etc.): | |

B4. Engagement and interaction with society (since 2003)

| | Total number |
|---|--------------|
| Adjunct professorships | |
| Popular science papers/books | |
| Textbooks | |
| Spin-off commercial companies | |
| Governmental/societal assignments | |
| Other activity according to traditions of the research field (specify; patents, popular science presentations etc.): | |

Part C: Departments Facts and Figures

Department of XX

1A. Personnel

2006 (Sept)

| | |
|-------------------------------------|--|
| Number of employees: | |
| Average age (all staff): | |
| % Female (all staff): | |
| Full-time equivalents (FTE): | |
| Full professor (chair): | |
| Full professor (promoted): | |
| Assoc. professor (docent): | |
| Postdoctoral staff: | |
| Doctoral student: | |
| Tot. FTE, Research active: | |
| FTE, Other staff: | |
| % Research active staff: | |

(Same data for Sept 2001)

1B. Personnel

Full professor (chair)

| | |
|--------------------|--|
| Age 2006 (average) | |
| Age 2001 (average) | |
| % female 2006: | |
| % female 2001: | |

(Same data for full professors/promoted, assoc. professor/docent, postdoctoral staff and doctoral students)

2. Research exams

Doctoral exams/year

| | |
|---------------------|--|
| Age 2006 | |
| 2001-2005 (average) | |
| 1995-2000 (average) | |

% Female

| | |
|---------------------|--|
| Age 2006 | |
| 2001-2005 (average) | |
| 1995-2000 (average) | |

Age at examination

| | |
|---------------------|--|
| 2001-2005 (average) | |
| 1995-2000 (average) | |

Net study time (years)

| | |
|---------------------|--|
| 2001-2005 (average) | |
| 1995-2000 (average) | |

(Same data for licentiate exams)

3. Publications

Publ (all languages) 2006

| | |
|------------------------|--|
| Article in journal | |
| Article, review/survey | |
| Article, book review | |
| Thesis, doctoral | |
| Thesis, licentiate | |
| Book | |
| Chapter in book | |
| Conference paper | |
| Conf. Proc. (editor) | |
| Report | |
| Collection (editor) | |
| Other publication | |
| Total | |

(Same data for 2005, 2004, 2003, 2002 and 2001)

4. Economy

2006

| | |
|-----------------------------|--|
| Total revenue (kSEK) | |
| Total costs (kSEK) | |

Some revenue sources

| | |
|----------------------------|--|
| Basic education | |
| Research/Res. Ed. (Gov) | |
| Externally funded research | |
| Commissioned research | |

| | |
|-----------------------------------|--|
| Research funds/ researcher (kSEK) | |
|-----------------------------------|--|

(Same data for 2001)

C. Terms of reference for expert panels

The present document describes the Terms of Reference to be used by the panels engaged in the research evaluation KoF 07. The document should be read together with the document *Instructions to Departments for the planning of panel site visits* and the documents A, B and C used by the departments in preparing their evaluation documents.

Background

Uppsala University, founded in 1477, has nine faculties located at five different campuses. A few facts are the following:

- Education and research across nine faculties and some 70 departments: theology, law, arts, languages, social sciences, educational sciences, medicine, pharmacy, and science and technology
- More than 40 programs of study and some 1,800 single-subject courses
- 40,000 undergraduate students and 2,500 graduate students
- Student exchange agreements with more than 400 universities in 40 countries
- More than 400 doctoral degrees every year
- Some 3,000 international collaborative research agreements
- 5,000 academic publications per year
- 6,000 employees-including 3,800 teachers/researchers
- 500 professors
- Turnover: MEURO 425; 60% of which for research and graduate education

The present evaluation is initiated by the vice-chancellor and it includes all departments and centers with research activities.

Objectives of the evaluation

The primary goal of the evaluation is to identify strong areas of research and successful research constellations in the broad spectrum of research at Uppsala University. It also aims at finding emerging science and potential for renewal. The evaluation should probe the standing of Uppsala University

research activities in an international perspective (whenever applicable) and does not aim at comparing different disciplines within the university. The evaluation will provide means to strengthen the quality of the scientific activities at the University by offering reliable background material for the decision-making process for future strategic decisions. It will also offer departments and faculties support in their own work formulating plans for future research.

Method of evaluation

The evaluation is carried out by using 24 panels with highly ranked international experts that evaluate and elucidate the research activities based on a five-day site visit together with information provided by the departments. Each panel has an international chair and a group of experts who together cover the different research areas. It also has one representative from another Swedish University, often representing an adjacent research field, which can assist in matters that require knowledge and insight in e.g. Swedish university and research funding practices. The panel is supported by a local administrator. The panel members receive background material in advance by means of an internet portal, in some cases supplemented with paper documents. The material consists of facts and figures regarding each department's personnel, economy, research examination, publication, and a number of quality indicators. It also includes a self assessment exercise where the department describes its research activities, networks and collaborations, and its view on future research directions and renewal of research. A limited number of publications, selected by the department, are appended to the document. Lists of all publications during the last five years are made available through the database OPUS.

A bibliometric analysis of the publications for the 5 year period 2002-2006 is conducted as a separate exercise in order to obtain a field-normalized picture of the international impact of the research.

Evaluation criteria

The basic unit for collection of background material is a department (in a few cases a centre). For departments with a relatively homogeneous research structure this is also the basic unit for evaluation. In several cases, though, different parts of a department represent research of diverse character, and then they have been distributed on different expert panels. In other cases where research at different departments are sufficiently related, departments are grouped together to represent a research area that can be evaluated by one expert panel.

The panel should try to work as a group to attain collective assessments, at the same time making use of the complementary expertise among the mem-

bers. The quality ratings apply to the research presented to the panels, which may not include all activities, although the panels are free to comment also on other research that they are aware of.

The quality rating for ongoing research activities is primarily expressed in terms of international standing. However, it is recognized that there are certain fields that are very specific and not directly assessable on an international scale, although they may be of highest quality. It may sometimes still be possible to make internationally comparative assessments regarding tools and methods used. The panels are asked to comment specifically in such cases.

The panels are instructed to make their quality assessments in a way that makes reference to international standards in all applicable cases. The following expressions for the quality rating of originality and significance are examples that may offer a satisfactory degree of definition and dispersion, and which the panels may want to use.

- Top-quality or world-leading research
- Internationally high standard
- Internationally recognized standard
- Acceptable standard

Since there may be a spectrum of different quality levels associated with a particular research field pursued, the panels are asked to qualify their assessments by stating to what extent a research activity meets a particular quality standard.

Whenever possible, the panels are encouraged to qualify their ratings in terms of comparisons with international groups and activities.

A separate quality rating should be given regarding emerging science and renewal in terms of scientific quality and feasibility for realization. Finally, the panel is asked to consider issues regarding the interaction with the society.

Working arrangements of expert panels

During the first day of the visit an introduction will be given and time allocated to plan the work during the visit. The panel chair coordinates the work of the panel and is also responsible for coordinating the writing of the report. A template for the report is provided and time given to write the report during the visit. The chair should give a brief account, an exit interview, of the main conclusions of the panel at the end of the visit. The report should identify existing strong research areas as well as emerging research with great potential, rather than grading all research conducted by the departments.

The site visits take place in three different periods, depending on panel. The first period is on March 26-30 2007; the second visit is on April 23-27 2007; the third visit is on May 7-11 2007. On May 12 there will be a meeting of all the panel chairs in order to review matters of cross-disciplinary character and to discuss certain points of interest arising in the evaluation process.

Final evaluation report

A final evaluation report will be edited by the project management. It will describe the procedure for the evaluation, and include the individual panel reports. It will also give an account for the conclusions made at the panel chair meeting regarding crossdisciplinary matters. Furthermore, it will present the results of the bibliometric study undertaken by external expertise. Finally, it will give recommendations concerning the use of the report in the continued work on quality development at the university.

Confidentiality and trust

The panel members accept not to misuse non-public information that is disclosed to him/her through the evaluation. The panel reports will be public when they are included in the final report. The panel members are required to declare any conflict of interest with respect to the subjects of the evaluation.

D. Panel report template

The expert panels are asked to assess the quality of research at the department/unit in an international perspective based on the instructions given in the *Terms of reference*. In particular, the panels are asked to identify strong research activities and potentially interesting opportunities for renewal. In the following are given headlines under which the panels are asked to provide comments and recommendations.

- General assessment of the department/unit
Give a brief account of the impressions of the research at the department. Comment on the research profile with respect to various issues like diversity, synergies, multi- and interdisciplinary activities, outreach, demographic and gender profile, etc.
- Quality of research
Comment on research activities, with emphasis on identifying strong research and successful constellations. Give quality ratings based on the instructions in *Terms of reference*
- Research environment and infrastructure
Comment on research environment, e.g. in terms of personnel composition (senior, junior, student, technical or other personnel etc.), local collaboration, interaction with visiting scientists, seminar activities, etc. Comment on the infra-structure, e.g. in terms of it being adequate, sufficiently available, or else.
- Networks and collaborations
Comment on the degree and quality of networks and international collaborations.
- Opportunities for renewal and emerging science
Comment on activities for renewal and emerging science and make assessments in terms of scientific quality of ideas and plans as well as their feasibility of realization. Comment on impressions of junior faculty activities.
- Actions for successful development
Comment on actions for the further improvement of the quality of the research.
- Other issues
Comment on other issues of choice, e.g. impressions of doctoral/post-doctoral training.

E. Panels member requirements

Panel composition

Chairperson

1 Swedish panelist

4-8 international panel experts

Required qualifications

Chairperson

Generalist from the research field in question

Distinguished scientist with high integrity

Experience from international evaluations

Suitable for assuming chair responsibilities

Not active in Sweden

Swedish panelist

Panel expert from other Swedish university than Uppsala, preferably active in adjacent field. Particular requirements of integrity when centrally active in the field.

Knowledgeable in Swedish university research circumstances. Preferably experience from research council work, or as dean or similar.

Panel expert

Preferably active outside Sweden, in the Nordic countries or in Europe. Outside Europe also possible. Distinguished scientist in one or several fields relevant to the panel.

Common rules to handle challenge issues apply regarding economical or research associated links to the evaluated department or unit. All subfields of the evaluated department should be represented in the panel. Gender balance should be aimed at.

Tasks

Chairperson

Lead the work of the panel

Judge and document the quality of the activities of the evaluated department or unit

Be responsible for the panel report

Offer advice on actions for successful development and renewal
Take part in discussions at chairperson meeting after the site visits

Swedish panelist

Offer information to the panel regarding conditions and circumstances specific of the Swedish university system.

Aid the panel in keeping the focus on the objectives of the evaluation

Take part in the quality assessment work of the panel

Panel expert

Judge and document the quality of the research activities of the evaluated departments and units

Give advice on actions for successful development and renewal

F. Panel members

Economics, Statistics (panel 1)

Niels Westergård-Nielsen

Professor, The Aarhus School of Business. Director, Centre for Corporate Performance, Aarhus School of Business.

Research interests include wage formation at individual and firm level, unemployment and employment, matched worker and firm data, personnel economics, and health economics.

Member of National Academy of Sciences (USA), Member of Scientific Committee of Centre for European Labour Market Research, University of Aberdeen.



nwn[-at-]@asb.dk

<http://www.asb.dk/staff/nat/nwn.aspx>

- **Niels Westergård-Nielsen**, Aarhus School of Business, Denmark (Chair)
- Michael W. Browne, Ohio State University, USA
- T. Joseph Sheehan, University of Connecticut, USA
- Steinar Ström, University of Oslo, Norway
- Timo Teräsvirta, University of Aarhus, Denmark
- Kurt Brännäs, Umeå universitet, Sweden
- *Panel guide: Sven Jungerhem, Uppsala University*

Business Studies, Social and Economic Geography, Housing and Urban Research (panel 2)



Daniël Van Den Bulcke

Emeritus Professor of International Management and Development at the University of Antwerp. Director of the Centre of International Management and Development-Antwerp (CIMDA) 1989-2006.

Chairman of the European International Business Academy (EIBA) 2003-2006.

Author and co-author of many books and articles on foreign direct investment issues and the activities of multinational enterprises in Europe and Asia, especially China.

daniel.vandenbulcke[-at-]ua.ac.be

- **Daniël Van Den Bulcke**, Universiteit Antwerpen, Belgium (Chair)
- Geoff Easton, Lancaster University Management School, United Kingdom
- Lars Gulbrandsen, Norwegian Social Research/NOVA, Norway
- Anne Haila, University of Helsinki, Finland
- Jussi S. Jauhiainen, University of Oulu, Finland
- Terje Wessel, University of Oslo, Norway
- Hugh Willmott, University of Cardiff, United Kingdom
- Claes G Alvstam, Göteborgs universitet, Sweden
- *Panel guide: Anders Jonsson, Uppsala University*

Sociology, Education, Educational Sciences, Media and Communication, Food Science (panel 3)

Ola Stafseng

Professor Ola Stafseng works in the Department of Education at the University of Oslo. His research interests are history of education, educational science and thoughts, sociology of education, history of childhood and youth, and youth research in general.



Between 1998 and 2002 he was Chair of the Consultative Meetings of Council of Europe's youth research coordination and cooperation.

ola.stafseng[-at-]ped.uio.no

- **Ola Stafseng**, University of Oslo, Norway (Chair)
- Petter Aasen, Studies in Innovation, Research and Education, Norway
- Christian Baudelot, Ecole Normale Supérieure, France
- Lotte Holm, University of Copenhagen, Denmark
- Stefan Hopmann, Universität Wien, Austria
- Knut Lundby, University of Oslo, Norway
- Pekka Sulkunen, University of Helsinki, Finland
- Ingegerd Rydin, Högskolan i Halmstad, Sweden
- *Panel guide: Thord Österberg, Uppsala University*

Government, Peace and Conflict Studies, Eurasian Studies (panel 4)



Klaus von Beyme

Professor of Political Science at the University of Heidelberg.

Professor Dr. Klaus von Beyme studied Political Science, History and Sociology at the universities of Heidelberg, Munich, Paris and Moscow.

His major research fields are Comparative Politics and Political Theory.

In 1982-1985 he was President of the International Political Science Association.

[klaus.von.beyme\[-at-\]urz.uni-heidelberg.de](mailto:klaus.von.beyme[-at-]urz.uni-heidelberg.de)

<http://www.hca.uni-heidelberg.de/de/?q=node/view/64>

- **Klaus von Beyme**, Universität Heidelberg, Germany (Chair)
- Janice Gross Stein, University of Toronto, Canada
- Katlijn Malfliet, Katholieke Universiteit Leuven, Belgium
- Lise Togeby, University of Aarhus, Denmark
- Raimo Väyrynen, University of Helsinki, Finland
- Øivind Østerud, University of Oslo, Norway
- Håkan Wiberg, Danish Institute for International Studies, Denmark
- *Panel guide: Anna Danielsson, Uppsala University*

Psychology (panel 5)

Lea Pulkkinen

Lea Pulkkinen is Professor of Psychology at the University of Jyväskylä, Finland.

Her major research project, the ongoing Jyväskylä Longitudinal Study of Personality and Social Development, has lasted almost 40 years. The study began as her doctoral dissertation, but it transitioned into a long-term longitudinal study in which the development of the same individuals has been followed from age 8. The latest data were collected in 2001, when the participants were age



42. The study has been conducted within the framework of emotional and behavioural regulation.

In 2005 she won the “Distinguished Scientific Contributions to Child Development Award” in USA.

lea.pulkkinen[-at-]psyka.jyu.fi
<http://www.cc.jyu.fi/leapulkk/index.html>

- **Lea Pulkkinen**, University of Jyväskylä, Finland (Chair)
- Anders K. Ericsson, Florida State University, USA
- Herta Flor, University of Heidelberg, Germany
- Svein Magnussen, University of Oslo, Norway
- Michael R. Waldmann, University of Göttingen, Germany
- Martin Ingvar, Karolinska institutet, Sweden
- *Panel guides: Anders Jonsson/Sven Jungerhem, Uppsala University*

Modern languages - Linguistics and Literary Science (panel 6)



Stig Johansson

Professor of Modern English Language, University of Oslo. Earlier assessment tasks include: English studies at the Danish universities; research in the Faculty of Humanities, Göteborg University; English studies at university-level in Sweden (head of expert panel).

Member of the editorial board of a number of journals and book series. Main publications in English linguistics, corpus-based

studies of language, and contrastive linguistics.

[stig.johansson\[-at-\]ilos.uio.no](mailto:stig.johansson@ilos.uio.no)

- **Stig Johansson**, University of Oslo, Norway (Chair)
- Włodzimierz Bolecki, Polska Akademia Nauk, Poland
- Bernt Brendemoen, University of Oslo, Norway
- Tove Bull, University of Tromsø, Norway
- Theo D'haen, Katholieke Universiteit Leuven, Belgium
- Kjersti Fløttum, University of Bergen, Norway
- Eva Hajičová, Univerzita Karlova - Praha, Czech Republic
- Michael Moser, Universität Wien, Austria
- Henrik Nikula, University of Turku, Finland
- Sirkka Saarinen, University of Turku, Finland
- Jan Svensson, Lunds universitet, Sweden
- *Panel guide: Marianne Dahlén, Uppsala University*

Early Languages and Cultures (panel 7)

Angeliki Laiou

Dumbarton Oaks Professor of Byzantine History at Harvard University. Permanent Member of the Academy of Athens.

Research and publications in: Economic history of Byzantium and the medieval Mediterranean; economic ideology; trade and credit; social history; history of the peasantry; history of women and the family; the crusades.

Fellow of the Medieval Academy of America. Fellow of the American Academy of Arts and Sciences.



[laiou\[-at-\]fas.harvard.edu](mailto:laiou[-at-]fas.harvard.edu)

- **Angeliki Laiou**, Harvard University, USA (Chair)
- Anders Ahlqvist, University of Helsinki, Finland
- Lutz Edzard, University of Oslo, Norway
- Robert Englund, University of California - Los Angeles, USA
- Odd Einar Haugen, Nordisk institutt - Bergen, Norway
- Heinz Hofmann, Universität Tübingen, Germany
- Asko Parpola, University of Helsinki, Finland
- Helmut Satzinger, Universität Wien, Austria
- Sergejus Temcinas, Vilnius University, Lithuania
- Gunhild Vidén, Göteborgs universitet, Sweden
- *Panel guide: Coco Norén, Uppsala University*

Aesthetic-Philosophical Disciplines (panel 8)



Anne-Marie Mai

Anne-Marie Mai is Professor at the Institute for Literature, Culture and Media, Syddansk Universitet.

In her research, she has especially focused on history of Danish Literature and history of Nordic Women's literature, and history of Scandinavian Enlightenment.

ammai[-at-]litcul.sdu.dk

<http://www1.sdu.dk/Hum/jhh/Anne-MarieMai/index.html>

- **Anne-Marie Mai**, Syddansk Universitet, Denmark (Chair)
- Liisa Husu, University of Helsinki, Finland
- Annemette Kirkegaard, University of Copenhagen, Denmark
- Simo Knuuttila, University of Helsinki, Finland
- Jan Svanberg, University of Oslo, Norway
- Krista Kodres, Estonian Academy of Arts, Estonia
- Clas Zilliacus, Åbo Akademi, Finland
- Anders Cullhed, Stockholms universitet, Sweden
- *Panel guide: Alberto Tiscornia, Uppsala University*

Historical-Anthropological Disciplines (panel 9)

Klavs Randsborg

Professor of Global Archeology at the SAXO-Institute, University of Copenhagen. He has worked at Washington University, Universiteit van Amsterdam and Universität Frankfurt am Main.

Director of the Centre of World Archaeology (CWA). Editor-in-chief of *Acta Archaeologica* and other publications.

randsb[-at-]hum.ku.dk

<http://www.worldarchaeology.net/>



- **Klavs Randsborg**, University of Copenhagen, Danmark (Chair)
- Per Boje, Syddansk Universitet, Denmark
- Birger Hjørland, Royal School of Library and Information Science, Denmark
- Matti Klinge, University of Helsinki, Finland
- Even Lange, University of Oslo, Norway
- Robert Paine, Memorial University of Newfoundland, Canada
- Helène Whittaker von Hofsten, University of Tromsø, Norway
- Anna-Maria Åström, Åbo Akademi, Finland
- Inge Jonsson, Stockholms universitet, Sweden
- *Panel guide: Monica Blom, Uppsala University*

Law (panel 10)



Vagn Greve

Professor of Criminal Law at the University of Copenhagen, Denmark.

His principal works to date are in the areas of hidden delinquency, traffic law, computer law, economic crime, and criminal law in general.

He has been the chief editor of *Nordisk Tidsskrift for Kriminalvidenskab* and *Juristen*. Member of editorial board for *European Journal of Crime, Criminal Law and Criminal Justice*.

vagn.greve[-at-]jur.ku.dk

<http://www.jur.ku.dk/medarbejdere/vangreve>

- **Vagn Greve**, University of Copenhagen, Denmark (Chair)
- Linda Nielsen, University of Copenhagen, Denmark
- Johanna Niemi-Kiesilainen, Nat'l Research Institute for Legal Policy, Finland
- Tuomas Ojanen, University of Turku, Finland
- Lena Sisula-Tulokas, University of Helsinki, Finland
- Kauko Wikström, University of Turku, Finland
- Lotta Vahlne Westerhäll, Göteborg University, Sweden
- *Panel guide: Bo Wennström, Uppsala University*

Theology (panel 11)

Carsten Riis

Dean, Faculty of Theology, University of Aarhus.

Research and teaching fields include the history of Christianity since Constantine the Great; the history of the Orthodox Church in the Balkans and relations between Christianity and Islam in the Ottoman Empire.

He has been member of the Ministry of Education's interdisciplinary subject advisers' group for the subject of Religion, member of the examining body for the subject of Religion in Teacher Education Colleges and are member of the examining body for the university subject of Religious Studies.



[cr\[-at-\]teo.au.dk](mailto:cr[-at-]teo.au.dk)

<http://person.au.dk/en/cr@teo>

- **Carsten Riis**, Aarhus Universitet, Denmark (Chair)
- Robert Heeger, Universiteit Utrecht, The Netherlands
- Heinrich Holze, Universität Rostock, Germany
- Aila Lauha, University of Helsinki, Finland
- Ingun Montgomery, University of Oslo, Norway
- Ulf Görman, Lund University, Sweden
- *Panel guide: Thomas Ekstrand, Uppsala University*

Mathematics, Scientific Computing, Image Analysis (panel 12)



Helge Holden

Helge Holden is Professor in the Department of Mathematical Sciences at the Norwegian University of Science and Technology.

He is a member of the Royal Norwegian Society of Sciences and Letters and the Norwegian Academy of Technological Sciences.

His research interests include: differential equations, mathematical physics (in particular hyperbolic conservation laws and completely integrable systems), stochastic analysis, and flow in porous media.

Helge.Holden[-at-]math.ntnu.no

- **Helge Holden**, NTNU, Norway (Chair)
- Sören Asmussen, University of Aarhus, Denmark
- Roland Glowinski, University of Houston, USA
- Ieke Moerdijk, Universiteit Utrecht, The Netherlands
- Jean Serra, École des Mines de Paris, France
- Guenther Trautmann, Universität Kaiserslautern, Germany
- Aslak Tveito, Simula Research Laboratory, Norway
- Karl-Fredrik Berggren, Linköpings universitet, Sweden
- *Panel guides: Björn Gembert / Sofia Wretblad, Uppsala University*

Physics (panel 13)

Charles S. Fadley

Charles (Chuck) Fadley is Advanced Light Source Professor of Physics, University of California – Davis, and Senior Faculty Scientist, Materials Sciences Division, Lawrence Berkeley Laboratory.

His research interests include condensed matter physics, surface and interface physics; homogeneous and nanophase materials science; magnetic materials and nanostructures, synchrotron radiation; photoelectron spectroscopy, diffraction and holography; x-ray absorption and emission, x-ray fluorescence holography.



fadley[-at-]physics.ucdavis.edu

<http://www.physics.ucdavis.edu/fadleygroup/>

- **Charles S. Fadley**, University of California - Davis, USA (Chair)
- Ignatios Antoniadis, CERN Theory Division, Switzerland
- Anne Borg, NTNU, Norway
- Roger Cowley, University of Oxford, United Kingdom
- Paul Kienle, Technische Universität München, Germany
- Risto Nieminien, Helsinki University of Technology, Finland
- Rashid Sunyaev, Max-Planck-Institut für Astrophysik, Germany
- Daniel Treille, CERN, Switzerland
- Anders Liljas, Lunds universitet, Sweden
- *Panel guide: Birgitta Gelin, Uppsala University*

Chemistry (panel 14)



Sir Alan R. Fersht

Herchel Smith Professor of Organic Chemistry and director of the MRC Centre for Protein Engineering at the University of Cambridge, United Kingdom.

Current major projects include protein folding, misfolding and disease; basis of molecular recognition; and structure-activity relationships of proteins involved in cancer and disease.

arf25[-at-]cam.ac.uk

- **Alan R. Fersht**, University of Cambridge, United Kingdom (Chair)
- Markus Antonietti, Max Planck Institute of Colloids and Interfaces, Germany
- Tim Clark, University of Erlangen-Nuremberg, Germany
- Reinhard Nesper, ETH Zürich, Switzerland
- Marja-Liisa Riekkola, University of Helsinki, Finland
- Britt-Marie Sjöberg, Stockholm University, Sweden
- *Panel guide: Olaf Svenningsen/Sofia Wretblad, Uppsala University*

Biology (panel 15)

Richard Buckingham

Richard H. Buckingham is "Directeur de Recherche" and Deputy Director at the Centre National de la Recherche Scientifique in Paris, France.

His current research interests include mechanism of protein synthesis termination and ribosome recycling as well as inhibitors of protein synthesis. He is a member of EMBO and editor of the *Biochimie* journal since 1979.



Richard.Buckingham[-at-]ibpc.fr

- **Richard Buckingham**, Inst. de Biologie Physico-Chimique, France (Chair)
- Merete Fredholm, University of Copenhagen, Denmark
- Volker Loeschcke, University of Aarhus, Denmark
- Cathie Martin, John Innes Centre, United Kingdom
- Susanne S. Renner, Munich University, Germany
- Nils Christian Stenseth, University of Oslo, Norway
- David Stuart, University of Oxford, United Kingdom
- Carl G Gahmberg, University of Helsinki, Finland - part-time from panel 20
- Lars Thelander, Umeå University, Sweden
- *Panel guide: Boel Åstrom, Uppsala University*

Earth Science (panel 16)



Roy H. Gabrielsen

Professor of Petroleum Geology at the University of Oslo. Section Head of the Geology and Geophysics Research Group (PEGG), University of Oslo.

Norwegian Delegate for European Strategy Forum on Research Infrastructures, European Commission (ESFRI). Deputy, Executive Board of Nordic Research Council NordForsk.

Member of Editorial Board of GEO (Norwegian journal of geosciences).

roy.gabrielsen[-at-]geo.uio.no

<http://www.geo.uio.no/petro/staff/royg.html>

- **Roy H. Gabrielsen**, University of Oslo, Norway (Chair)
- Michael Benton, University of Bristol, United Kingdom
- Alan G. Green, ETH Zürich, Switzerland
- Atsumu Ohmura, ETH Zürich, Switzerland
- Jens Chr. Refsgaard, Geological Survey of Denmark and Greenland, Denmark
- Elisabeth F. Haggård, Stockholms universitet, Sweden
- *Panel guide: Olaf Svenningsen, Uppsala University*

Engineering Sciences (panel 17)

Jens Gobrecht

Professor at the Laboratory for Micro- and Nanotechnology of the Paul Scherrer Institut, Switzerland.

Areas of interest and expertise include micro- and nanotechnology, silicon and solid state processing and technology, photovoltaic energy conversion devices, solar cells, electrochemical energy conversion and storage and power electronics.

He is currently building up and managing the “Institut für Nanotechnische Kunststoff-Anwendungen INKA” at the University of Applied Sciences Nordwestschweiz.



[jens.gobrecht\[-at-\]psi.ch](mailto:jens.gobrecht[-at-]psi.ch)

- **Jens Gobrecht**, Paul Scherrer Institut, Switzerland (Chair)
- John S Colligon, Manchester Metropolitan University, United Kingdom
- Sami Franssila, Helsinki University of Technology, Finland
- Reino Laiho, University of Turku, Finland
- Peter Lund, Helsinki University of Technology, Finland
- Petra Lundström, Fortum Corporation, Finland
- Sune Svanberg, Lunds universitet, Sweden
- *Panel guide: Boel Åström, Uppsala University*

Information Technology, Information Science, Signals and Systems (panel 18)



Jeffrey D. Ullman

Professor of Computer Science at Stanford University (Emeritus 2003-).

Research interests include database theory, database integration, data mining, and education using the information infrastructure.

Founder and CEO of Gradiance Corporation, whose goal is to provide better, cheaper homework and programming-lab support for college courses.

ullman[-at-]cs.stanford.edu

<http://infolab.stanford.edu/~ullman/>

- **Jeffrey D. Ullman**, Stanford University, USA (Chair)
- Michel Gevers, Université Catholique de Louvain, Belgium
- Heikki Mannila, University of Helsinki, Finland
- Michael O'Boyle, University of Edinburgh, United Kingdom
- Bernhard Plattner, ETH Zurich, Switzerland
- Kari-Jouko Rähkä, University of Tampere, Finland
- Ingeborg Sølvsberg, NTNU, Norway
- Reinhard Wilhelm, Universität des Saarlandes, Germany
- Torbjörn Hedberg, Luleå University of Technology, Sweden
- *Panel guide: Bo Petterson, Uppsala University*

Pharmacy (panel 19)

Alexander T. Florence

Professor Emeritus at the School of Pharmacy, University of London.

Areas of expertise include: Pharmaceutical Nanotechnology, Physical Pharmaceutical Chemistry, Drug Delivery Systems, Vesicular Systems Based on Nonionic Surfactants, Micromanipulation of Vesicles and Soft Matter, Novel Dendrimers, Surface Chemistry, Pharmaceutical Education and Colloid Chemistry.



ataylorflorence[-at-]aol.com

- **Alexander T Florence**, University of London, United Kingdom (Chair)
- Gerardus J. De Jong, Universiteit Utrecht, The Netherlands
- Hannes Enlund, University of Kuopio, Finland
- Henning Gjelstrup Kristensen, University of Copenhagen, Denmark
- Steen Honoré Hansen, University of Copenhagen, Denmark
- Santi Mario Spampinato, Università di Bologna, Italy
- Krister Holmberg, Chalmers University of Technology, Sweden
- *Panel guide: Eva Björkman, Uppsala University*

Pre-clinical Research (panel 20)



Tomas Lindahl

Professor Tomas Lindahl is a Principle Scientist at the Cancer Research-UK Clare Hall Laboratories in UK.

He is originally from Stockholm, Sweden, but moved to London in the beginning of the 1980s.

His main field of research is the mechanisms of DNA repair after precarcinogenic damage of human cells. He is a member of Academia Europaea and a fellow of the Royal Swedish Academy of

Sciences.

tomas.lindahl[-at-]cancer.org.uk

- **Tomas Lindahl**, Cancer Research UK, United Kingdom (Chair)
- Henning Beck-Nielsen, Odense University Hospital, Denmark
- Carl G Gahmberg, University of Helsinki, Finland - also in panel 15
- Beverly Griffin, Imperial College, United Kingdom
- Jyrki Heino, University of Turku, Finland
- Hartmut Osswald, Universität Tübingen, Germany
- Sven Enerbäck, Göteborg University, Sweden
- *Panel guide: Anita Ericsson, Uppsala University*

Public Health and Caring Sciences (panel 21)

Hanneke de Haes

Hanneke de Haes is Professor and chair in the Department of Medical Psychology at the University of Amsterdam Academic Medical Centre.

She was and is a member of a number of national and international committees covering psychosocial oncology, quality of life research, communication research, ethics in health care, and of research review boards of the European Organization of Research on Treatment of Cancer, the Dutch Organisation for Scientific Research, the Dutch Aids Fund and the Netherlands Cancer Foundation.



[j.c.dehaes\[-at-\]amc.uva.nl](mailto:j.c.dehaes[-at-]amc.uva.nl)

- **Hanneke de Haes**, Academic Medical Centre/AMC, The Netherlands (Chair)
- Gary L Albrecht, University of Illinois-Chicago, USA
- Faith Gibson, UCL Institute of Child Health, United Kingdom
- Matti Klockars, University of Helsinki, Finland
- Karen Luker, University of Manchester, United Kingdom
- Peter Allebeck, Karolinska University Hospital, Sweden
- *Panel guide: Anita Ericsson, Uppsala University*

Clinical Research (panel 22)



Peter Sleight

Professor Peter Sleight works at the John Radcliffe Hospital as an honorary NHS consultant, and as Emeritus Professor of cardiovascular medicine at the University of Oxford.

He was the Field Marshal Alexander Professor of cardiovascular medicine for 22 years at the University of Oxford. He is also an Emeritus Fellow of Exeter College at Oxford.

Dr. Sleight has been honoured with numerous international awards, most recently the Mackenzie Medal from the British Cardiac Society.

peter.sleight[-at-]cardiov.ox.ac.uk

- **Peter Sleight**, University of Oxford, United Kingdom (Chair)
- Marion de Jong, Erasmus MC, The Netherlands
- Caj Haglund, University of Helsinki, Finland
- Krister Höckerstedt, University of Helsinki, Finland
- Ola Saugstad, Rikshospitalet, Norway
- John W Sear, University of Oxford, United Kingdom
- Robert Hahn, Södertälje sjukhus, Sweden
- *Panel guide: Boel Åstrom / Anita Ericsson, Uppsala University*

Neuroscience (panel 23)

Heikki Rauvala

Professor Heikki Rauvala is Director of the Neuroscience Center at the University of Helsinki.

His main research interests are the development and plasticity of the nervous system; extracellular matrix-associated factors in tumour biology and development.

He is a member of the Biocentrum Helsinki Organization and the American Neuroscience Association.



Heikki.Rauvala[-at-]helsinki.fi

<http://www.helsinki.fi/neurosci/rauvala.htm>

- **Heikki Rauvala**, University of Helsinki, Finland (Chair)
- Ulrik Malt, Rikshospitalet, Norway
- Ole Petter Ottersen, Center for Molecular Biology and Neuroscience, Norway
- Arne Schousboe, University of Copenhagen, Denmark
- Peter J. Tyrer, Imperial College London, United Kingdom
- Anders Blomqvist, Hälsouniversitetet i Linköping, Sweden
- *Panel guide: Anders Jonsson, Uppsala University*

Genetics and Pathology (panel 24)



Aarno Palotie

Professor Aarno Palotie works at the University of Helsinki. There he leads a research group in Molecular Medicine. The overall goal of the group is to study the genetic susceptibility of complex neurological traits.

The main focus for the past years has been genetics of migraine and multiple sclerosis (MS).

Aarno.Palotie[-at-]helsinki.fi

- **Aarno Palotie**, University of Helsinki, Finland (Chair)
- Lars Bolund, University of Aarhus, Denmark
- Daniel Chourrout, University of Bergen, Norway
- Tim Crook, The Institute of Cancer Research, United Kingdom (late withdrawal)
- Sirpa Jalkanen, University of Turku, Finland
- *Panel guide: Olaf Svenningsen, Uppsala University*

G. Instructions to departments for the planning of panel site visits

The panels will visit the departments during **Tuesday, Wednesday and Thursday** in the respective weeks (week 13, 17 or 19 depending on panel, see page 4-5). Monday will be reserved for an introductory session and panel work planning, and Friday is used for panel report finishing and exit interview, where the main conclusions are presented to deans and department representatives. The panel evaluation is concluded at lunch on Friday.

The departments are invited to participate in the planning of the site visits.

A time plan has to be established to allocate time for discussions of the various research activities included in the evaluation. The time schedule has to be made in accordance with the schedule shown in the table on page 3. A 10 min break between different research activities or laboratory visits is recommended. The plan needs to be negotiated within the departments respectively between departments in order to satisfy the various research groups (see page 4,5 for distribution of departments on panels). The faculty/section management is responsible for the final schedule.

Remember that the panelists are expected to be updated on the department's research through the written summaries. The panel chair will be in charge of the evaluation at the visit, and he/she will decide on the format of the interviews. The department chair or other assigned person may start with a brief introduction to outline the structure of research activities, but one should not plan a tight schedule of presentations. Instead one should be prepared to discuss items that are brought up by the panel and make short presentations when asked for. Individuals thus need to be prepared to be available to the panels for discussions. The selection of individuals to be present at the various panel interviews is done by the departments.

The departments need to provide a list of the researchers associated with the respective sub-sessions to the panelists when they arrive. The individuals that will be present should be marked in the list. Also, the individuals appearing in the panel meetings should have a clearly visible name badge, last name in big capitals recommended. An assistant from the disciplinary area office will be accompanying each panel to assist in various matters.

In order to give opportunities for contact with faculty and research students it is suggested to use lunch and coffee breaks. For example, one could plan for a mingle session with coffee after the panel members have had lunch. The evaluation project can only support lunch and coffee for the panel members,

but if the departments find a possibility to offer common lunch with research staff it might be of benefit for contact. It is suggested that catering service working lunch is offered, but the department is certainly encouraged to find other ways to organize lunch and coffee breaks. A sum of 200 SEK per panel member and day can be provided from the evaluation project budget to support lunch and coffee for the panel members.

The departments need to have available at least two copies of the publications that have been listed in the evaluation document, including books. Also, material needed to qualify the quantitative information given in the B section of the evaluation document may be needed. It is recommended that provisions to meet panelists' needs of borrowing computers with internet access are made, and that printing facilities are available. Since the panel will need to have short internal meetings during the day a suitable room is required. If possible, the meeting room used for the interviews and discussions can be used also for this.

The exit interview on Friday is meant to communicate the main conclusions of the panel to deans, department chairs and professors in charge of a program.

The departments will be given the opportunity to comment upon the panel evaluation report before it is included in the final report.

Summary of tasks by departments needed for the site visit planning.

- Time schedule for the appearances of researchers from the different research areas of the panel during Tuesday, Wednesday, Thursday 09:00 – 15:00 in the week of the site visit.
- Lists of researchers (those with presence at panel interview marked) for the different research areas made available at the beginning of the visit.
- Name badges with last name in clearly visible capital letters for all who appear at panel interviews
- Arrangement of lunch and coffee for the panelists.
- Meeting room available to the panel for internal meeting.
- Two copies of the selected publications listed in the evaluation document available to the panelists.

The departments are asked to submit to the dean a coarse schedule for the panel visits in accordance with the above as early as possible. The finished schedule has to be available to be presented to the panel chair at least 3 weeks before the visit.

Frame time schedule for KoF 07 panel visits

| Day | Event | Time | Place |
|------------------|---|-------------|--------------|
| Sunday | Meeting of Chairs and Swedish panelists | 18:00-20:00 | Hotel |
| Monday | Registration | 10:00-10:30 | Gustavianum |
| | Introduction | 10:30-11:00 | |
| | Guided tour to Gustavianum museum | 11:00-12:00 | |
| | Lunch | 12:00-14:00 | Walmstedtska |
| | Planning of panel visits | 14:00-15:00 | University |
| | Coffee | 15:00-15:30 | -“- |
| | Planning of panel visits | 15:30-17:00 | -“- |
| | Dinner | 18:00 | tbd |
| Tuesday | Department visit incl. lunch | 09:00-15:00 | Departments |
| | Internal meeting | 15:00-17:00 | -“- |
| | Vice-chancellor’s dinner | 18:30 | tbd |
| Wednesday | Department visit incl. lunch | 09:00-15:00 | Departments |
| | Internal meeting | 15:00-17:00 | -“- |
| | Dinner | 18:00-19:00 | Hotel |
| | Internal meeting | 19:00-21:00 | -“- |
| Thursday | Department visit incl. lunch | 09:00-15:00 | Departments |
| | Internal meeting | 15:00-17:00 | -“- |
| | Dinner | 18:00-19:00 | Hotel |
| | Internal meeting | 19:00-21:00 | -“- |
| Friday | Internal meeting | 09:00-11:00 | University |
| | Exit interview | 11:00-12:00 | -“- |
| | Lunch | 12:00-14:00 | tbd |
| | End of visit | | |

H. Site visits

It was decided that the panel visits should take place during three different weeks, in March, April and May according to the panel list below. A separate chair meeting (all chairs) took place immediately after the last site visit.

| 26-30 March | 23-27 April | 7-11 May |
|-----------------------|---|---|
| Psychology | Economics, Statistics | Modern Languages - Linguistics and Literary Science |
| Law | Business Studies, Social and Economic Geography, Housing and Urban Research | Early Languages and Cultures |
| Theology | Sociology, Education, Educational Sciences, Media and Communication, Food Science | Aesthetic-Philosophical Disciplines |
| | Government, Peace and Conflict Studies, Eurasian Studies | Historical-Anthropological Disciplines |
| Chemistry | Mathematics, Scientific Computing, Image Analysis | Physics |
| Biology | Engineering Sciences Earth Science Information Technology, Information Science, Signals and Systems | |
| Pharmacy | Public Health and Caring Sciences | Clinical Research |
| Pre-clinical Research | Genetics and Pathology | Neuroscience |

One centrally located hotel in Uppsala was used for all site visit weeks, to house all evaluators and to provide for panel working rooms during evenings. The overall schedule for the site visits weeks were:

| | |
|----------------|---|
| Sunday | Meeting of Chairs and Swedish panellists (hotel) Welcome Buffet (hotel) |
| Monday | Registration, Introduction and Guided tour (Gustavianum) Lunch (Walmstedtska) Welcome – the Vice-chancellor (University Hall) Introduction by deans/vice-rectors (University Hall) Planning of panel visits (University Hall) Dinner (Linnaeus Garden or Västgöta) |
| Tuesday | Department visits Vice-chancellor’s dinner (Västgöta or Linnaeus Garden) |
| Wed-Thu | Department visits |
| Friday | Internal meeting (hotel) Exit interviews (hotel) Lunch (hotel) |

The evaluation project was responsible for the program on Monday and Friday, and the different departments took care of Tuesday-Thursday. One panel guide from the university administration was connected to each panel and handled practical issues as well as support with additional evaluation material. Support staff (students) served in an evaluation help-desk at the hotel during afternoons and evenings to help with typing, copying etc.

Exit interviews were conducted before lunch on Friday, to give the department heads and deans an opportunity to respond to the main findings from the panels.

I. Results of questionnaire

Things you liked MOST at/with KoF 07:

- The positive and cooperative attitude of everybody we met. Openness and positive attitude on all sides.
- Good discussions. Friendly atmosphere. Met colleagues also outside our own fields.
- Colleagues, our guides and the beautiful city of Uppsala.
- Being in the panel was rewarding. The very good working atmosphere in the team.
- Disagreement was handled perfectly.
- To have a panoramic view of a high-class university carefully prepared for me.
- The opportunity to better understand the Swedish university system. Ready access to all information we needed.
- Professional, perfect arrangements of everything in KoF 07. We were very well taken care of.
- Poster prepared and representing some of the research projects - personal contact with researchers
- The more informal lunches/coffees made discussion possible.

Things you liked LEAST at/with KoF 07:

- Being too busy all the time. Intense working always consumes a lot of energy.
- The schedule was quite tight, leaving individuals little time to gather their thoughts.
- The process could possibly have been shortened. It is difficult to be away for 5 days.
- The difficulties to handle disparate departments in a short time.

Make SPECIFIC proposals or remarks - for us to be able to improve future site visits:

- If reviews on different monographs published by the different dept's had been provided beforehand, evaluation would have been easier.
- More selected material should be printed and sent by mail; makes it more easy to find the important items.
- More publications to look at in advance.
- The pre-information from departments was not always carefully prepared, they should put more efforts into it.
- Even clearer information on what you (don't) want.
- The Swedish panellist should be selected in a closer field to be of more scientific use.
- PhD students must be more active during presentations of the departments.
- More time for communication with our colleagues from UU.
- The final meetings of the panels were too busy - a couple of extra hours would have helped.

Table 1.1: Site visit, Mars

| Statement | 5 | 4 | 3 | 2 | 1 | Average |
|--|----------------|-------|---------|----------|-------------------|---------|
| | Strongly agree | Agree | Neither | Disagree | Strongly disagree | |
| Information before the site visit (website, mail etc.) was satisfactory | 13% | 39% | 17% | 26% | 4% | 3.30 |
| The Internet portal was easy to use and information accessible | 39% | 30% | 22% | 9% | 0% | 4.00 |
| Answers to your requests (by mail etc.) were satisfactory | 57% | 43% | 0% | 0% | 0% | 4.57 |
| The department evaluation documents (part A, B, C) covered the research activities reasonably well | 4% | 43% | 26% | 26% | 0% | 3.26 |
| Your panel had the necessary competencies needed for the review | 52% | 43% | 4% | 0% | 0% | 4.48 |
| You had enough time to cover and assess the research on-site | 57% | 35% | 9% | 0% | 0% | 4.48 |
| The presentations (Tuesday-Thursday) were according to your need | 22% | 65% | 9% | 4% | 0% | 4.04 |
| The time schedules (Tuesday-Thursday) were kept | 52% | 39% | 4% | 4% | 0% | 4.39 |
| There was sufficient time available for discussion | 26% | 35% | 13% | 26% | 0% | 3.61 |
| The arrangements (Tue-Thu) were satisfactory (rooms, lunches etc.) | 43% | 57% | 0% | 0% | 0% | 4.43 |
| To participate in the evaluation was valuable to yourself | 30% | 65% | 4% | 0% | 0% | 4.26 |
| The feedback and report from your panel will be of great value | 35% | 65% | 0% | 0% | 0% | 4.35 |
| The report template was useful | 22% | 70% | 9% | 0% | 0% | 4.13 |

Table 1.2: Site visit, April

| Statement | 5 | 4 | 3 | 2 | 1 | Average |
|--|----------------|-------|---------|----------|-------------------|---------|
| | Strongly agree | Agree | Neither | Disagree | Strongly disagree | |
| Information before the site visit (website, mail etc.) was satisfactory | 2% | 72% | 7% | 14% | 5% | 3.53 |
| The Internet portal was easy to use and information accessible | 7% | 63% | 14% | 14% | 2% | 3.58 |
| Answers to your requests (by mail etc.) were satisfactory | 37% | 63% | 0% | 0% | 0% | 4.37 |
| The department evaluation documents (part A, B, C) covered the research activities reasonably well | 12% | 60% | 7% | 19% | 2% | 3.60 |
| Your panel had the necessary competencies needed for the review | 40% | 58% | 0% | 2% | 0% | 4.35 |
| You had enough time to cover and assess the research on-site | 14% | 60% | 14% | 9% | 2% | 3.74 |
| The presentations (Tuesday-Thursday) were according to your need | 21% | 51% | 28% | 0% | 0% | 3.93 |
| The time schedules (Tuesday-Thursday) were kept | 35% | 58% | 2% | 5% | 0% | 4.23 |
| There was sufficient time available for discussion | 21% | 63% | 7% | 9% | 0% | 3.95 |
| The arrangements (Tue-Thu) were satisfactory (rooms, lunches etc.) | 47% | 51% | 2% | 0% | 0% | 4.44 |
| To participate in the evaluation was valuable to yourself | 42% | 51% | 5% | 2% | 0% | 4.33 |
| The feedback and report from your panel will be of great value | 16% | 77% | 7% | 0% | 0% | 4.09 |
| The report template was useful | 21% | 49% | 21% | 7% | 2% | 3.79 |

Table I.3: Site visit, May

| Statement | 5 | 4 | 3 | 2 | 1 | Average |
|--|----------------|-------|---------|----------|-------------------|---------|
| | Strongly agree | Agree | Neither | Disagree | Strongly disagree | |
| Information before the site visit (website, mail etc.) was satisfactory | 36% | 60% | 2% | 2% | 0% | 4.29 |
| The Internet portal was easy to use and information accessible | 43% | 50% | 2% | 5% | 0% | 4.31 |
| Answers to your requests (by mail etc.) were satisfactory | 60% | 40% | 0% | 0% | 0% | 4.60 |
| The department evaluation documents (part A, B, C) covered the research activities reasonably well | 38% | 50% | 5% | 7% | 0% | 4.19 |
| Your panel had the necessary competencies needed for the review | 45% | 55% | 0% | 0% | 0% | 4.45 |
| You had enough time to cover and assess the research on-site | 21% | 57% | 7% | 14% | 0% | 3.86 |
| The presentations (Tuesday-Thursday) were according to your need | 29% | 71% | 0% | 0% | 0% | 4.29 |
| The time schedules (Tuesday-Thursday) were kept | 52% | 48% | 0% | 0% | 0% | 4.52 |
| There was sufficient time available for discussion | 19% | 50% | 12% | 19% | 0% | 3.69 |
| The arrangements (Tue-Thu) were satisfactory (rooms, lunches etc.) | 69% | 29% | 2% | 0% | 0% | 4.67 |
| To participate in the evaluation was valuable to yourself | 69% | 26% | 5% | 0% | 0% | 4.64 |
| The feedback and report from your panel will be of great value | 23% | 70% | 7% | 0% | 0% | 4.15 |
| The report template was useful | 36% | 60% | 5% | 0% | 0% | 4.31 |

J. Photos from the site visits



Figure J.1: Boat trip on the lake Mälaren with panel chairs



Figure J.2: Site visit March



Figure J.3: Site visit April



Figure J.4: Site visit May