CURRICULUM VITAE

Hans Peter Zima

Professor Emeritus, University of Vienna, Austria

and

Principal Scientist (retired), Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA

Hans P. Zima studied at the University of Vienna, Austria, where he received his Ph.D. degree in Mathematics and Astronomy in 1964. He began his career in Computer Science that year at a company owned by the German computer pioneer Konrad Zuse and continued to work for computer manufacturers and software companies in Germany and the USA until 1973. During this period his responsibilities included the development of a commercial optimizing Algol 60 compiler (1969) and the design and implementation of PROGRESS, one of the first high-level real-time programming languages (1970-1973) at System Development Corporation in Santa Monica, California.

In 1973, Dr. Zima accepted a research position at the University of Karlsruhe, Germany; two years later he was appointed Professor for Computer Science at the University of Bonn, Germany, a position which he held until 1989. His research during that period initially dealt with the modeling of systems of parallel processes in shared-memory architectures, leading to his first book " Operating Systems: Parallel Processes" (1976, in German). Research on data flow analysis and optimization algorithms in compilers for imperative programming languages resulted in the publication of two subsequent books dealing with the theory and practice of optimizing compiler development (1982/83). During a sabbatical semester spent at the IBM Research Laboratory in San Jose, California, he worked for a year with Peter Lucas on constraint languages and expert systems (1983/84).

Motivated and supported by the first German supercomputer project, "SUPRENUM", Dr. Zima and his group at Bonn University started conducting research in the area of high-level language, compiler, and tool support for massively parallel distributed-memory architectures in 1985, beginning a scientific journey that would last for over 20 years. An early result of this work was the development of SUPERB, the first Fortran-based compilation system for distributed-memory architectures. SUPERB converts sequential Fortran 77 programs augmented with data distribution directives into explicitly parallel message-passing programs. The first Ph.D. thesis in this field, by Michael Gerndt, was an important step in the direction towards high-level languages for scalable architectures, such as High Performance Fortran (HPF) and, later, the languages developed in DARPA's High Productivity Computing Systems (HPCS) program.

Between 1988 and 1989 Dr. Zima spent a year at Rice University working with Ken Kennedy on parallelizing compiler technology. During that period he finished his book " Supercompilers for Parallel and Vector Computers", written together with Barbara Chapman (1990), with a Japanese translation published in 1991. This was the first book to coherently describe analysis and compilation technology for parallelizing compilers.

After returning from Rice University Dr. Zima accepted a professorship for Applied Computer Science at the University of Vienna (1989). The experience gained with early compiler work paved the way for the development of the data-parallel Vienna Fortran language (1992), which was defined in a joint effort together with Barbara Chapman and Piyush Mehrotra. Vienna Fortran was the first language to provide a complete specification of mapping constructs in the context of Fortran, offering high-level features for data distribution and alignment as well as work distribution; it became a major input for the High Performance

Fortran (HPF) development. The language work of the Vienna Institute headed by Dr. Zima continued beyond HPF, with the objective of improving target code efficiency and broadening the application spectrum. This resulted in the design of the HPF+ and Opus languages, and in the development of the Vienna Fortran Compiler, a Fortran 90-based compilation and runtime system supporting irregular, adaptive, and heterogeneous applications. The design of HPF+ (1996-1998), conducted within a European Union ESPRIT project in cooperation with industrial application developers, focused on enhancing the performance of advanced applications such as weather forecasting, crash simulation, and combustion engine simulation; Opus provides a high-level task-parallel interface for multidisciplinary applications running on heterogeneous systems. Additional work in the Vienna research group led to a range of tools for performance analysis and source-level debugging, supporting efficient high-level programming for parallel machines. From 1997 through 2007, Dr. Zima headed the Priority Research Program Aurora, a program funded by the Austrian Science Foundation (FWF). A major goal pursued by the Aurora project was to achieve synergy between language, compiler and tool designers on the one hand, and application designers in fields such as material science, photonics, semiconductor simulation and financial optimization on the other hand.

After spending a sabbatical semester at the California Institute of Technology in 1999/2000, Dr. Zima assumed a position as Principal Scientist at the Jet Propulsion Laboratory, California Institute of Technology. His responsibilities included the design of the software architecture and high-level programming support for massively parallel architectures. From 2002 through 2006, he worked in the Cray-led Cascade project of the DARPA-sponsored High Productivity Computing Systems (HPCS) program, playing a leading role in the development of the Cascade high-level programming language, Chapel, and an introspection-based infrastructure for autonomous system operation. Furthermore, Dr. Zima led an Advisory Committee for DARPA developing a research agenda for high-productivity programming language systems. More recently, he became involved in the design of fault-tolerant software environments for future autonomous high capability space-borne computing systems.

In October 2007, Dr. Zima became a Professor Emeritus at the University of Vienna, Austria. After retiring from the Jet Propulsion Laboratory in October 2011, Dr. Zima has continued working as a consultant in NASA's next-generation on-board architecture design effort, and in advanced software research for future massively parallel exascale systems.

Dr. Zima is the author or co-author of about 200 publications, White Papers, and Technical Reports, including 4 books and 130 refereed publications. He has presented about 300 scientific lectures at universities, research institutions, and international conferences. He served as General Chair of the ACM International Conference on Supercomputing (ICS'97) in Vienna, as Program Chair or Vice Program Chair at a number of international conferences, and has been a member of more than 50 Program Committees.

He is a founding member of the editorial boards of the Journal for Universal Computer Science (J.UCS), the International Journal of High Performance Computing and Networking (IJHPCN), and the International Journal of Computational Science and Engineering (IJCSE); and an editorial board member of Concurrency: Practice and Experience, and Parallel Processing Letters. Dr. Zima has been regularly a member of review boards for academic promotions, and of Ph.D. and Habilitation committees. He has reviewed a large number of papers for international conferences and journals, including IEEE Transactions on Parallel and Distributed Systems, ACM Computing Surveys, Parallel Computing, and Concurrency: Practice and Experience. Furthermore, he has been a member of review panels for the National Science Foundation (NSF) and the European Union's ESPRIT Research Program as well as national research agencies in Germany, India, Italy, Ireland, and Austria. He served on the European Union's HPCN Advisory Board and as a member of the Steering Committee of the ACM International Conference on Supercomputing and of the Advisory Board for the EUROPAR Series of Conferences and the book series "Advances in Computing Science" published by Springer Verlag.

Dr. Zima is a member of the Association for Computing (ACM), IEEE, Gesellschaft für Informatik (Germany), the Humboldt Society (Germany), the Austrian Computer Society, and the Planetary Society.

Selected Publications

1. Zima,H.P.: Operating Systems: Parallel Processes (Book, in German)
   Reihe Informatik Band 20, Bibliographisches Institut, Mannheim
   First printing 1976, second printing 1980, third printing 1986
2. Zima,H.P.: Compiler Construction I: Analysis (Book, in German)
   Reihe Informatik Band 36, Bibliographisches Institut, Mannheim
   First printing 1982, second printing 1989
3. Zima,H.P.: Compiler Construction II : Synthesis and Optimization (Book, in German)
   Reihe Informatik Band 37, Bibliographisches Institut, Mannheim (1983)
4. Zima,H.P., Bast,H.-J., Gerndt,M.: SUPERB - A Tool For Semi-Automatic MIMD/SIMD Parallelization
   Parallel Computing, Vol.6, pp. 1-18 (1988)
5. Zima,H.P., with Chapman,B.M.: Supercompilers for Parallel and Vector Computers (Book)
   ACM Press Frontier Series/Addison-Wesley (1990), Translated into Japanese (1991)
6. Chapman,B.M., Mehrotra,P., Zima,H.P.: Programming in Vienna Fortran
   Scientific Programming Vol.1,No.1, pp.31-50
   (Fall 1992)
7. Ujaldon,M., Zapata,E.L., Chapman,B.M., Zima,H.P.: Vienna Fortran/HPF Extensions for Sparse and Irregular Problems and Their Compilation
   IEEE Transactions on Parallel and Distributed Systems, Vol.8, No.10, pp.1068-1083 (October 1997)
8. Mehrotra,P.,Van Rosendale,J.,Zima,H.P: High Performance Fortran: History, Status and Future
   In: Zapata,E. and Padua,D.(Eds.): Parallel Computing, Special Issue on Languages and Compilers for Parallel Computers, Vol.24, No.3-4, pp.325–354 (1998)
9. Benkner,S. and Zima,H.P: Compiling High Performance Fortran for Distributed-Memory Architectures
   In: Trystram,D.(Ed.): Parallel Computing, Special Anniversary Issue, Vol.25, pp.1785-1825 (1999)
10. Sterling,T.L. and Zima,H.P.: Gilgamesh: A Multithreaded Processor-In-Memory Architecture for Petaflops Computing
    Proc. SC2002 – High Performance Networking and Computing, November 2002, Baltimore.
11. Zima,H.P.: Introspection in a Massively Parallel PIM-Based Architecture.
    In: Joubert,G.R.,Nagel,W.E.,Peters,F.J., and Walter,W.V.(Editors): Parallel Computing: Software Technology, Algorithms, Architectures and Applications, Advances in Parallel Computing Volume 13, 2004,pp.441-448.
12. Diaconescu,R.E. and Zima,H.P.: An Approach to Data Distributions in Chapel
    International Journal on HPC Applications, Special Issue on High Productivity Languages and Models, Vol.21, No.3 (2007)
13. Chamberlain,B.L., Callahan,D., and Zima,H.P.: Parallel Programmability and the Chapel Language
    International Journal on HPC Applications, Special Issue on High Productivity Languages and Models, Vol.21, No.3 (2007)
14. Zima, H.P.: From FORTRAN 77 to Locality-Aware High Productivity Languages for Peta-Scale Computing
    Scientific Programming, Vol. 15. Issue 1 (January 2007), pp.45-65, IOS Press, Amsterdam, The Netherlands, 2007
15. Kennedy,K., Koelbel,C., and Zima,H.P.: The Rise and Fall of High Performance Fortran
    Communications of the ACM, Vol.54, No. 11, pp.74-82, 2011
16. Zima,H.P.,James,M.L.,and Springer,P.L.: Fault-Tolerant On-Board Computing for Robotic Space Missions
    Journal of Concurrency and Computation: Practice and Experience, John Wiley and Sons, 2011