The emperor's new rag

Jeffrey Gray

Journal of Consciousness Studies. Executive editors J. A. Goguen and Robert K. C. Forman. *Imprint Academic, PO Box 1, Thorverton, Exeter EX5 5YX, UK. 4/yr. $48, £28 (institutional); $25, £15 (personal).*

NEW scientific journals commonly meet a need spawned by novel methods or by the opening up of a fresh field to experimental investigation. *Journal of Consciousness Studies* is a clear exception. There is as yet no agreed method for studying consciousness, nor even any consensus that it is yet (or ever?) amenable to scientific investigation. This new journal has emerged, rather, from a change in the *Zeitgeist*: consciousness is no longer taboo. As an example of this change, in 1971 I published a paper on consciousness that elicited just two requests for reprints; a quarter of a century later I am a welcome guest at conferences where I say exactly the same things! Has the field moved on, even if I have not? Is it yet part of the 'art of the soluble' (in Peter Medawar's lapidary phrase)?

The editors neatly duck this question by subtitling their journal "Controversies in Science and the Humanities" and setting its scope to cover "all aspects" of consciousness, including psychology, neuroscience, physics, philosophy, artificial intelligence, and social, cultural, ethical and religious issues. The result is a heady brew, although neither psychology nor neuroscience so far figures much in the mixture. This is a pity, for it is here that speculation is likely eventually to find its strongest empirical constraints. In fact, experimental data of any kind hardly figure in the first four issues. In the one exception, an intriguing report (by Nunn *et al.*) of the effects on psychological performance of being hooked up to an electroencephalogram machine, the methods and results of the experiments are discreetly tucked away in an appendix. What there is most of so far is, perhaps surprisingly, physics, with Roger Penrose's quantum-gravity theory holding centre stage (inspiring *inter alia* the paper by Nunn *et al.*); and, less surprisingly, philosophy, mostly alas going over very familiar ground.

The contributions about mystic experiences and theological issues avoid the wilder shores and, for the most part, provide education (or sometimes entertainment) even for the hard-headed (so long as they are not so hard-headed as still to suppose that the problem of consciousness is not a problem at all). So, do we need this journal, even if no-one is yet sure how to make the problem of consciousness soluble? Yes, we do: there is no other journal quite like it, and one day we shall, I think, look back to its appearance as a defining moment when the prologue to the real play (whatever that may turn out to be) began. And, at the price, it's a snip!

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The Santa Fe telegraph

Karl Sigmund

Artificial Life. Edited by Christopher G. Langton. *MIT Press. 4/yr. USA $135, Canada $161.57, elsewhere $151 (institutional); USA $45, Canada $65.27, elsewhere $61 (personal); USA $25, Canada $43.87, elsewhere $41 (student/retired).*

SANTA Fe is to artificial life what Vienna has been to psychoanalysis. Through a sequence of well-timed moves (international workshops, a polished series of proceedings, popular books), Christopher Langton has established a tight-knit community of a-lifers that now seems strong enough to warrant a journal of its own. This is of course how any new discipline grows: what seems specific to both a-life and ψ-a, however, is the pivotal role played by one founding father, the strong impact on the *Zeitgeist* and, coming from

Flower power: development of the hawkweed flower *Hieracium umbellatum*; from *Artifical Intelligence: An Overview* ed. C. G. Langton (MIT Press, $42, £24.95).

less well-meaning colleagues, persistent doubts about whether or not these fields belong to science.

The editor-in-chief of *Artificial Life* is Langton himself (no other choice would be conceivable). The editorial board is essentially a fair cross-section of the usual visitors to the Santa Fe workshops — almost all regular contributors to the proceedings volumes (*Artificial Life: Vols I–III*) which did so much for the field. Langton, who is considerably more easy-going than Freud ever was, allows a remarkable profusion of topics to be included in his journal. The first three numbers, written by members of the editorial board, serve to stake out the claims in a vast domain that covers hardware, software and wetware alike, dealing with computer viruses, genetic algorithms, bioengineering, community construction, artificial intelligence, adaptive behaviour, molecular evolution, self-assembling toolkits, pattern formation, robotics and so on, the whole lot liberally sprinkled with philosophical comments on ethical and social questions.

Taken together, these overview articles would make a solid successor to the three proceeding volumes, and leave no doubt that this highly talented set of authors could keep turning out more of the same. But that, of course, is not the point: as Langton writes, the introductory articles are merely meant to prime the pump. It is too early yet to know if a steady flow is running. The first 'regular' contributions are encouraging: their overall tendency, however, is to stake out still more claims rather than to dig deeper. In the long run, that can be dangerous. Sooner or later the field will have to be circumscribed. It is not just the sum of what the crowd of insiders is doing.

Although Langton refrains from defining artificial life (speculating that "perhaps in ten years or so" it might be possible), he writes that the bread and butter of the journal will consist of papers on computational approaches to open problems in biological theory and in the application of biological principles to engineering. So far there seems to be too little of the former. If this is a sign of continuing sympatric speciation, it would rob the new field of an important opportunity: to study evolution through thought-experiments in a context free of historical contingencies.

For a-life's aficionados, the journal is a must. Theoretical biologists, empirical mathematicians and the readership of *Physica D* will also do well to follow *Artificial Life*.
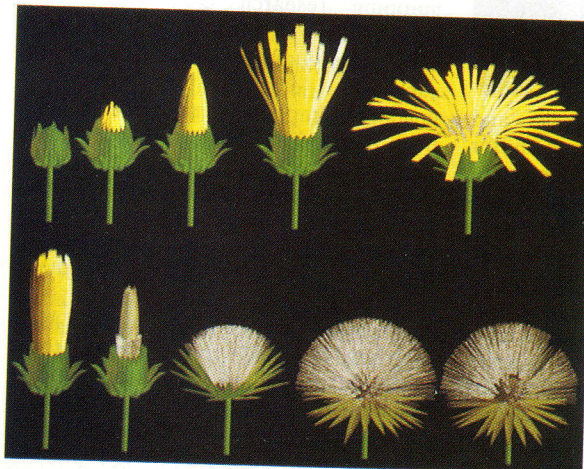
The price is reasonable. The journal offers scope for letters, articles, reviews and reports. Graphics and colour plates are, not unexpectedly, of high-gloss quality. To some it may seem odd that a journal on a discipline so cheerfully close to science fiction is still published as hard copy: but it is paired with an on-line electronic bulletin board called "ALIFE". Let us hope that the implicit challenge to computer hackers and virus breeders will remain resistible. □

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Inner visions

James V. Haxby

Human Brain Mapping: A Journal Devoted to Functional Neuroanatomy and Neuroimaging. Editor-in-chief Peter T. Fox. *Wiley-Liss. 4/yr. USA $190, Canada and Mexico $230, elsewhere $245 (institutional); USA $80, elsewhere $90 (personal).*

INTEREST in research into the functional organization of the human brain has been heightened over the past decade by the use of high-resolution, three-dimensional brain-imaging methods for measuring local haemodynamic changes reflecting patterns of neural activity. These methods can be used to map higher cognitive functions of the intact
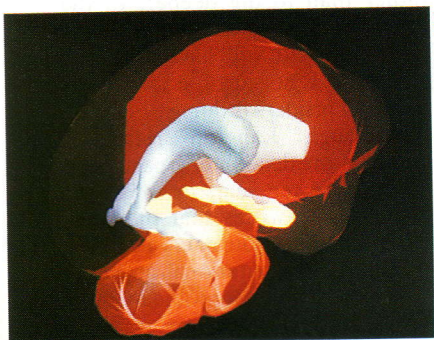
Mind matter: MRI of an adult human brain.

human brain, such as language and memory, as well as sensory and motor functions. Because of the development of new functional brain-imaging methods accessible to more and more neuroscientists, and the rehabilitation of other methods for measuring brain function to compensate for some of the inherent shortcomings of these imaging techniques, we are on the brink of an explosive growth in human brain-mapping research. Workers in this endeavour come from diverse areas in medicine, psychology and the information sciences. The health of the new field was evident at the first annual Brain Map Meeting, held last June in Paris as a

satellite of the International Society for Cerebral Blood Flow and Metabolism Meeting, which attracted more than 800 participants.

Human Brain Mapping, which was launched in 1993, has the potential to provide an integrated forum for this rapidly developing interdisciplinary field. Although the most innovative and groundbreaking work will probably continue to appear in leading general science and neuroscience journals, *Human Brain Mapping* promises to provide a home for reports now scattered among dozens of journals in psychology, neurology, psychiatry and physiology.

Unlike many new journals, *Human Brain Mapping* will make it easier for investigators to find reports of relevant research by workers in different disciplines. The need for such a journal is apparent, and already another journal, *NeuroImage*, has altered its editorial policy to become a second, integrated forum for brain-mapping research, and promises to augment interdisciplinary communication further by including reports on brain mapping in nonhuman species.

Until recently, the method of choice for this work has been positron emission tomography (PET). Because of the cost and complexity of this method, research has been limited to a handful of well-funded and productive centres. The recent development of magnetic resonance imaging (MRI) methods for measuring haemodynamic changes promises to open up the field. Functional MRI allows neuroscientists to engage in human brain-mapping research using scanners already installed for clinical imaging, and so require a fraction of both the cost and the staff necessary for PET studies. Although functional MRI is still dauntingly difficult to master, it will enable many more centres to engage in functional brain-imaging research. The first fruits of this methodological advance are just starting to appear in the literature.

Further expansion in human brain-mapping research comes from the rehabilitation of other methods of noninvasive study of human brain function, such as electro- and magneto-encephalography. These methods have been plagued by problems in identifying the location of structures that generate signals, but they clearly offer temporal resolution on a timescale more appropriate for mapping sequential events in the human brain. It is hoped that these methods can be successfully integrated.

The early issues of *Human Brain Mapping* have included reports using all these methods, as well as reports of mapping research on postmortem human brains and of new methods of analysis. The large format and high-quality reproduction allow the dramatic colour images — a hallmark of the field — to be shown to magnificent effect. Stunning cover illus-

trations also make this an eye-catching journal for the office and coffee-table. □

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Neurobiological networks

Jack Cowan

Journal of Computational Neuroscience. Editors John Rinzel, James M. Bower, Eve Marder, Idan Segev, Charles Wilson and John P. Miller. *Kluwer. 4/yr. Dfl474, $270 (institutional); Dfl165, $75 (personal).*

WORK on neural models and networks started effectively in the 1930s. At that time, the only specialized journal partly
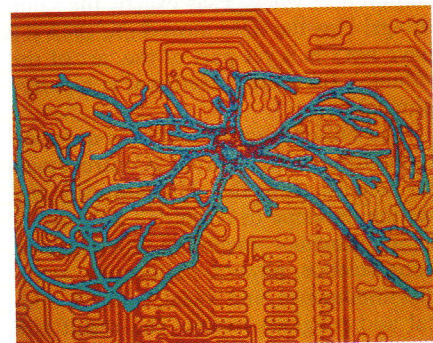
Neural integration: nerve cell on silicon chip.

devoted to these topics was *Bulletin of Mathematical Biology*, founded by N. Rashevsky of the University of Chicago. It was in this journal that McCulloch and Pitts published their famous 1943 paper making the connection between neural networks and logic. After the Second World War, there was a clearly recognized need for other outlets, triggered in part by developments in cybernetics applied to brain research. The result was another journal, *Kybernetik*, which appeared in 1961 and was later renamed by Springer as *Biological Cybernetics* to appeal more to Anglo-Saxon librarians. Its chief editor was W. Reichardt. For several years this was the principal specialized journal for theoretical and computational neuroscience.

But in the early 1980s, developments in the theory of neural networks, particularly John Hopfield's work on symmetric weight networks, and especially the so-called 'backpropagation' network built by David Rumelhart, Geoffrey Hinton and Ron Williams, led to an avalanche of new work, and computational neuroscience and artificial neural networks came into focus as a distinct field. Not surprisingly, several different specializations have