cult to see why they stay in practice. But the book reminds you of the comment attributed to Sir Keith Joseph when he was UK health minister: "I can see it works in practice but does it work in theory?"

It cannot work in theory because, as Leys shows, there is no theory of trauma. Or more accurately, there are two opposing theories, 'mimetic' and 'antimimetic'. According to the mimetic theory, patients do not consciously remember a traumatizing event, but store in their unconscious mind an imitation of it, in which they identify with whoever caused the trauma. The antimimetic theory holds that patients do remember the trauma consciously, but as an outside observer.

These two theories have implications for treatment which it seems impossible to reconcile. In the first there is an ambiguity between victim and perpetrator that is absent in the second. There is an issue of whether what patients say can be believed, particularly in the mimetic theory, where the possibility of accurate memory is completely ruled out. Leys shows that the desirable convergence to a single theory has not happened, and indeed could not happen. Rather, opinion has swung between the two poles of the theories, with the choice of pole driven by the politics of the disaffected rather than by evidence.

Leys' book is excellent, but it is a difficult read. The subject matter is complex and those writing about it are not given to plain English. For a book in which the particular should illustrate the general, the ending is its weakest part. It may be good practical advice to suggest that, in this instance, theory is self-contradictory and that therapists need to be pragmatic, but it dodges the real issue.

We live in a world where, rightly or wrongly, treatment is increasingly held between the pincers of genetics and the evidence-based medicine movement. The Human Genome Project is hailed not only as the answer to all health problems, but as the best bet for understanding the human condition. If I were a psychoanalyst or therapist, I would be energetically seeking to put my house in order. ■

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More on the brain

Brain Mapping: The Disorders
edited by John C. Mazziotta, Arthur W. Toga & Richard S. J. Frackowiak
Academic, $199.95, £125

Brain Mapping: The Systems
edited by Arthur W. Toga & John C. Mazziotta
Academic, $199.95, £125

Paragon lost

Paradigms Regained: A Further Exploration of the Mysteries of Modern Science
by John L. Casti
William Morrow/Little, Brown: 2000. 287 pp. $25/£20

Michael Baumann

If *Paradigms Regained* were a textbook, it would simply run as a second, updated edition under the 1989 title *Paradigms Lost*. But second editions in science trade books probably do not sell that well. So, John Casti takes a '10-years-after' look at the six Big Questions in popular science that he has discussed before: the origin of life, the genetic determination of human behaviour, the acquisition of human language, the design of artificial intelligence and the existence of extraterrestrial intelligence and of an observer-independent reality.

In his new book, Casti retains the fictional courtroom setting already employed in *Paradigms Lost* — this time, arguments for and against his 1989 verdicts are presented to an appeal court. The author makes the big assumption that his reader is familiar with the previous verdicts, and so it is often not immediately clear who is appealing. Each of the six topics is introduced with a brief summary of the corresponding chapter in *Paradigms Lost*. This is followed by a description of the various scientific results on the topic that have been produced in the past decade. The 'intelligent layperson' can then judge the evidence before being presented with Casti's decision.

Paradigms Regained is about evolution — the evolution of life, of social behaviour, of syntactic language and of intelligence (natural, artificial and extraterrestrial). It is also about the evolution of science itself. Pieces of evidence under each topic are presented mostly diametrical and mutually exclusive. What was first, metabolism or genes, nature or nurture, rules of a game or players, language or language organ, symbols or associations, observed or observer? Arguments presented in the book reflect René Descartes' metaphor of the world as a machine. For example, in support of Noam Chomsky's theory of a hard-wired 'universal grammar', Casti tells the story of Christopher, who, in spite of having a non-verbal IQ of 65, has learned 16 languages. But just as space, time, matter and energy do not exist independently but rather generate one another, the question here should be how non-verbal abilities and language-learning potential interacted in Christopher's development. Such is the dialectical scheme of things — much harder to study, of course.

The results of Casti's analyses support his explicit message that scientific "theories are created to be replaced". Of the six 1989 verdicts, two are 'reversed', the first one in rather vague terms: "… the evidence has mounted considerably supporting the claim that genetic makeup causes a predisposition to various types of human social behaviors." (But how exactly does one measure "a predisposition", and what is the variation between different behaviours or among individuals?) For the second reversed verdict, the recent theories of decoherence and consistent histories justify the new view of the existence of a single objective reality. Regarding the question of the terrestrial origin of life, the earlier affirmative verdict is upheld, but a different mechanism, the scenario of an RNA world, is now favoured.

Paradigms Regained appears to have been put together in a hurry, with the odd irrelevant topic popping up. For example, Casti introduces Zipf's law (an inverse-power law describing the frequency of the appearance of a word in a language as a function of the rank order of that word), and notes that it can be derived from random text studies without any appeal to optimization. He then goes on to argue that, because some arbitrary-sized pieces of so-called 'junk DNA' follow Zipf's law (whereas those of coding DNA don't), junk DNA may encode important information after all. Other examples are a reference to Easter Island's rongorongo tablets and one-paragraph introductions to Machiavellism and Swahili.

The book ends abruptly, with no conclusion in spite of the fact that two of its six topics include important and recently widely discussed ethical problems. First, the Human Genome Project, whose results will present us with a future somewhere along the continuum between Aldous Huxley's *Brave New World* (genetic determination minimal) and Sony Pictures' *GATTACA* (nurture irrelevant). And second, there is computer high technology, which one day might allow us to download what remains of ourselves into replaceable hard- or wetware. This potentiality also deserves consideration when pondering extraterrestrial intelligence and the Fermi paradox — or, in Arthur C. Clarke's tradition: if I can upload my consciousness into the fabric of the Universe, why would I bother to communicate with human intelligence?

Overall, a second, revised edition of *Paradigms Lost* would have been a more worthy project for this well-read scholar and effective communicator of complex scientific concepts to the interested non-specialist Whatever the case, Casti's book is a reminder that, as scientists, we are responsible for disseminating our findings clearly to the public. After all, they provide the primary funding for basic research. ■

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