

enough, but he goes on to state that such cows could grow to the size of an elephant. He seems to have forgotten the inverse square rule. Such a cow would collapse with snapped legs, lacking the elephant's profound evolutionary reorganization to cope with its weight.

Stephen Nottingham's *Eat Your Genes* gives a very useful account of the regulatory process for genetically modified (GM) foods in the EU and the United Kingdom, so it is odd that he seems unaware of how much change has recently taken place in Europe. Perhaps more seriously, he barely mentions the *Codex Alimentarius* Commission, set up by the United Nations in 1962. Consumers, as opposed to producers, have very little say in its operation; it too needs a decisive shift in the balance of power within it towards the public interest.

The EU and the United States are at odds over the safety of traded food in general but of GM foods in particular, as are the member states of the World Trade Organization. Nottingham is interesting on the increasing political influence of multinational companies on the WTO. Reforms in the interest of consumer safety, similar to those in train for the United Kingdom and the EU, are urgently needed at the global level.

The public has rapidly become more

interested in the use of genetic modification in food production, and Nottingham's book deserves to be widely read. Most of the debate is now highly polarized, either for or against the technology in principle. *Eat Your Genes* is refreshing, if less entertaining as a spectator sport, for being descriptive rather than particularly partisan. He is good on the possible dangers from gene combinations that would not have been produced by traditional selective breeding. Ordinary hazard analysis depends on a track record of past accidents to calculate future risks. Modern biotechnology is just too new for such calculations to be realistic.

Nottingham went to press too soon to welcome the Royal Society's statement "Genetically modified plants for food use". It recommends that the government commission an over-arching body to bring together a number of departmental responsibilities and to monitor the wider issues associated with GM plants. The statement lists problems that this new body should consider if the existing advisory committees do not, such as long term impacts on the ecosystem.

Nottingham is right to emphasize that most developments so far have been driven by profit rather than consumer needs. He could usefully have written more on long-term problems that need public funding for a

search for solutions. Take the food supply if the climate changes. If the climate becomes more extreme, agriculture will need varieties that can cope. As global warming becomes an acute problem, the market mechanism will work; but it will by then be too late for anything close to an optimal response to the problem. Even if the climate does not change much, research that adapts crops and farm animals to harsh conditions would be valuable in those parts of the world already short of food, and which will be shorter still with the increase in world population. Another problem is the nutritional quality of foods such as vegetables or fruits. The relative quantities of vitamins or micronutrients that they contain are not apparent to consumers as they buy a particular variety, so here the market mechanism is less effective. It is of course more efficient for qualities such as appearance or shelf life.

In discussions that ought to centre on a cost-benefit analysis of GM foods, the critics focus on the costs, the industry on the benefits. Nottingham's book will help his readers to make the debate more fertile — and less boring. □

John Godfrey is at 41 Lawford Road, London NW5 2LG, UK.

Hawaiian headgear

These feather 'god heads' were brought to England from the Hawaiian islands on one of Captain James Cook's ships in 1780, and painted by Sarah Stone. The artist was employed by the entrepreneur Sir Ashton Lever to record the 'curiosities' in his private museum. Besides ethnographic material collected on Cook's round-the-world voyages, the museum contained specimens used by naturalists for their descriptions of new species. From *Sarah Stone: Natural Curiosities from the New Worlds* by Christine E. Jackson (Merrell Holberton/Natural History Museum, London, £29.95, \$45). The book is in the new *Art of Nature* series which highlights little-known artists whose work is preserved in the Natural History Museum.



The freedom not to listen

Silencing Scientists and Scholars in Other Fields: Power, Paradigm Controls, Peer Review and Scholarly Communication

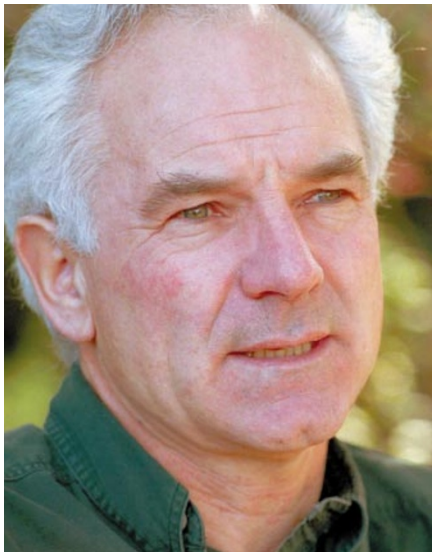
by Gordon Moran

JAI Press: 1998. 186 pp. £47, \$73.95 (hbk), £25, \$39.50 (pbk)

John Ziman

We come into science starry-eyed, upright and trustful of our fellow pilgrims in this noble venture. Alas, we and they prove as morally frail as the rest of humanity. In time, we mostly learn to accept and cope with the petty injustices, vanities and deceptions incidental to our profession. But occasionally an apparent affront or iniquity cannot be tolerated, and bursts out of the private sphere into public conflict. And very occasionally a contestant seeks support by generalizing their case into an attack on some feature of the whole system.

Gordon Moran's argument is that he, and many other scientists and scholars, have been "silenced" — that is, they have been deliberately prevented from saying or writing something that ought, in all conscience, to have been said or written on some particular scientific or scholarly matter. In his case, the contested point was whether the great equestrian portrait of Guido Riccio in Siena was actually painted in 1330 by Simone



Peter Duesberg's claims that HIV is not the cause of AIDS have not been censored but simply rejected.

Martini, or by a less famous artist in 1352. I have no idea of the rights or wrongs in this controversy, but Moran's account of it is so obviously one-sided that I discount it as evidence of a more general phenomenon.

Indeed, his definition of this phenomenon is altogether too general. The case of the scientist prevented by the body that employs him from revealing an embarrassing research result is entirely different from that of the academic scientist whose paradigm-breaking discovery, although widely publicized, is ignored by an intellectually blinkered scientific community. At one end of the scale we may find illicit intimidation to cover up a crime; at the other end, a substantial group of free citizens has a perfect right not to be bounced by a zealous heretic out of what they honestly consider to be the established truth, however wrong-headed this may appear in hindsight.

By fudging the notion of "whistle-blowing" to include cases that are really quite different — for example, Peter Duesberg's well known but thoroughly controverted claims about AIDS — Moran also misses another very important point. On the one hand, it is truly scandalous that scientists employed in confidential research can be muzzled, against the public interest, by quasi-legal corporate coercion. On the other hand, contractual confidentiality is a necessary element of commerce, and prudent silence can sometimes be a civic virtue. For example, an unjustified public accusation of scientific fraud is as reprehensible, and as punishable in law, as any other irresponsible defamatory communication. But this ethical ambivalence is not specific to science, since it clearly afflicts many other trusted professionals such as accountants, engineers, physicians and even security guards.

The heart of the matter, which Moran skirts around but does not tackle directly, is

whether a scientist has an intrinsic right to voice unwelcome scientific opinions in public. The legal situation is quite clear. In a democratic society, scientists have exactly the same rights to free speech as other citizens — no more and no less. They are perfectly at liberty to present their views vocally or in written form. Of course, this might be very costly, but so it is for people or organizations with religious, political or commercial claims that they believe to be just as cogent.

In practice, of course, what these "scientists and scholars in other fields" really want is to be permitted to present their views in reputable journals and books, preferably for free. But here authors have limited legal leverage, except in respect to copyright. The huge social institution called 'the scholarly literature' is largely controlled by unpaid editors and referees and is regulated almost entirely by customary practices and commercial opportunities. It is not answerable to any other authority for its decisions, and cannot easily be brought to book for its occasional follies and injustices.

On the whole, scientific and scholarly editors are extremely conscientious, but so much has to depend on opinion. As Moran admits in relation to the Internet, without critical filtering all serious scientific discourse would be drowned in a flood of wild shouting. But, since editors have no alternative to peer review, how can they ensure that their advisers are not biased? Since expert referees often fail to understand unconventional arguments, who might teach them to be more open-minded? And since the scientific archives are riddled with entrenched errors, how could they ever be intellectually cleansed?

In the end, however, I am not persuaded that the cases Moran cites add up to a systematic pattern of injustice. Let us remember that the scientific community is an agonistic forum. Knowledge is created as much by heated argument as by ice-cold experimentation. The norms and practices of scientific communication pit researchers verbally against one another, but strictly limit their rhetorical weapons. Whatever the hidden passions, superficial impersonality, courtesy and respect for past achievement are as mandatory in the public arena as impeccable logic and empirical fact. It may be deeply hurtful to be defeated in such combats, but it is not necessarily unjust or even shameful. One may yearn to have one's ideas accepted and acclaimed, but one has to accept that the world may decide differently.

But this book is a timely reminder to all of us in the academic community that the practices that are the prime guarantee of the credibility of our enterprise can seem very cruel to those who are crushed by them. □

John Ziman, *emeritus professor of physics at the University of Bristol, is at 27 Little London Green, Oakley, Aylesbury, Bucks HP18 9QL, UK.*

How the brain holds our attention

The Attentive Brain

edited by Raja Parasuraman

MIT Press: 1998. 577 pp. \$65, £51.95

Steven Yantis

In the last decade, explosive growth in the field of cognitive neuroscience has yielded a new scientific society, several new journals and hundreds of articles (many in these pages), all focused on how the brain subserves perception, cognition and behaviour. This convergence of methodologies from psychology, neuroscience, neuroimaging and cognitive neuropsychology has produced dramatic advances in our conception of problems that previously had been addressed separately in each field.

Raja Parasuraman has now compiled an exciting collection of papers aimed at one of the most fruitful subjects cognitive neuroscientists have tackled: attention. The overarching questions are these: given that we can perceive, think about and do only (roughly) one thing at a time — in other words, given that perception, cognition and action are necessarily selective — how is that selection achieved, and how is it coordinated with the behavioural demands faced by the organism? How do behavioural goals, for example, modulate sensory input? How are multiple simultaneous tasks juggled? The consensus that emerges from this book is that there is no single 'centre' for attention in the brain; instead, there are multiple distributed systems of attention that keep things running smoothly and efficiently.

Eight chapters in the first section provide incisive tutorials on the methods of cognitive neuroscience as applied to the study of attention. These methods include invasive neuro-anatomical and neurophysiological techniques, noninvasive neuroimaging approaches (electroencephalography, positron emission tomography and functional magnetic resonance imaging), the analysis of impaired performance in people with brain damage, and computational modelling of attentional control. These chapters alone make the book exceptionally valuable: they offer a comprehensive overview of the key methods of cognitive neuroscience, and their focus on a common topic illustrates how a multifaceted issue like attention can be approached from many different angles, each offering a distinct perspective. This section is aimed at readers who have only a minimal familiarity with basic neuroscience.

Each of the remaining chapters focuses on a substantive question about the workings of attention and then applies one or more of the techniques discussed in the first section to that question. Several of the chap-