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BOOK REVIEWS

BRAIN EDEMA. PATHOGENESIS, IMAGING AND THERAPY. 1990. Advances in Neurology Vol 52. D.M. Long (Ed) Raven Press: New York pp 558

This a reference text organised to emphasise brain oedema as a major clinical problem arising in many neurological conditions. The book has sixty eight Chapters and twenty three Abstracts provided by some 249 specialists participating in the Meeting of the International Society for the Study of Brain Edema held in Baltimore, 1987. The contents are intended to be diverse covering brain physiology, clinical studies through to basic molecular science and techniques of evaluating oedema such as magnetic resonance, imaging, computed tomography and positron emission tomography.

Of particular interest to scientists interested in oxygen radicals will be Chapters describing the involvement of free radicals in tissue damage, brain oedema and degenerative processes. Chapters 7, 13 and 23 describe reperfusion damage following periods of brain ischaemia and discuss attempts to limit injury by administering superoxide dismutase (SOD). As with most ischaemia/reperfusion studies different investigators find conflicting results with SOD as a protective agent. This is not surprising, however, since one must take into account the different models and interventions used before valid comparisons can be made. Traumatic brain injury is also thought to lead to the generation of reactive organic and inorganic oxygen radicals and, in Chapters 26 and 27 we have interesting reports on attempts to use intervention therapy. Polyethylene glycol-linked SOD appeared to have no beneficial effects on vasogenic brain oedema produced by cold-induced injury, but more success was seen with impacted head injury treated with a novel 21-aminosteroid. A series of nonglucocorticoid steroids have been developed by the Upjohn Company as bifunctional antioxidants possessing both radical scavenging and metal chelating properties.

Figures, diagrams, photographs, Tables and a comprehensive index contribute to a quality publication. To off set this, however, it is a book of conference papers presented some four years ago. For the brain oedema specialist this book gathers together a comprehensive collection of papers and references in the field.

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THE DISCIPLINE OF CURIOSITY: SCIENCE IN THE WORLD
JANNY GROEN, EEFKE SMIT and JUURD EIJSVOOGEL, Eds.
Elsevier Science Publishers, New York.
156 pp. 1990.

To quote the introduction, "in this book of interviews, fifteen opinion leaders (prominent figures from international politics, business communication and science) give their vision of the changing role of science in society". Unfortunately, the interviewees, who include the Director-General of UNESCO, the President of the Club of Rome, the Director of the National Science Foundation, the Chairman of the Société Générale de Belgique and the chief scientist of Royal Dutch/Shell, turn out to be more notable than quotable. This is in large part the fault of the format of the book, which consists of paraphrased statements by each of the opinion leaders, speckled with quotations and interspersed with biographical filler. The six interviewers do not seem to have guided the process in any way, so that there is no focus, and the cut and thrust that might have resulted from discussions on specific topics is sadly missing. As a result, the "vision" too often turns out to be bland and allusive:

> "In his sixth floor office in the UNESCO building, overlooking the stately, sand-coloured buildings of central Paris, Federico Mayor shows a fervor and a sense of urgency not often found among bureaucrats. 'We must not delay treatment of some aspects of ecological conditions, because tomorrow it may be too late,' he asserts."

The book does throw off a few sparks. As might be expected, many of these come from John Maddox, the Editor of *Nature*, who touches on such topics as the role of academic entrepreneurship in the success of U.S. science and the benefits to science that may arise from the liberated nations of Eastern Europe. Harry Beckers, the top scientist at Royal Dutch/Shell, points out the bizarre reversal of roles when governments want to be responsible for industrial R & D while industry is asked to participate in and provide the money for education. What sparks there are tend to die, however, because the book does not contain suggestions for further reading.

A few common themes are thrown up by the interviewees. One is the danger of the increasingly unequal spread of knowledge, mostly seen as a North–South divide, which will exacerbate inequality in income. One interviewee, Seun Ogunseitan, has set up the African Centre for Science and Development Information, working out of his apartment with the goal of being a non-governmental scientific information agency for Nigeria and eventually across Africa. Little attention is paid to the same problem within Western countries, the development of a sub-population of technological illiterates who will, under free trade, compete economically with the lowest paid workers anywhere in the world.

A second theme is the economic success of Japan. Interviewee Robert Solow describes a lunch after he won the Nobel prize, in which the Chairman of the visiting Japanese delegation said it was wonderful that Japan and the United States have reached this very comfortable arrangement. In the United States we did basic science and in Japan they turned it into a salable product. Interviewee David Halbertstam attributes this to "flooding the factory floor with engineers". Interviewee Hisao Yamada, Professor of Information Science and Management at the University of Tokyo attributes Japan's success at applications and relatively lower achievement in basic science as arising from the same roots: an emphasis on uniformity, diligence and control.

"The nation works hard but does not think hard". Interviewee Shigeo Minowa, an economist who has spent most of his life in scientific publication, makes the same point more obliquely: he feels that Japan is good at information collection but not in communication. None of this adds anything to the extensive literature on this subject.

Two interviewees mention in passing the (then current) scandal arising from the banning of steroid hormones in animal E.C.'s Council of Ministers, against expert opinion but convenient for the Common Agricultural Policy. As this example amply demonstrates, the power to set standards is an important modern complement to the power to tax as a power to destroy. Standard setting bodies are one of the commanding heights of the modern economy, a topic that could have used amplification.

Since the direct content of the interviews tends to be inconsequential, it is of some residual interest to look at their implied content. The Europeans tend to be corporatist. The (Dutch) introduction to the book complains that "[decision makers] do not speak the language of science any more than the scientists can express themselves in the language of the decision maker", a simplification which smacks of the chain of command rather than of the market economy with information coming out of every telephone. Dr. Beckers of Royal Dutch/Shell warns against the upward spiral, where competing companies increase their spending on research, with their products becoming more and more innovative, until, in his model, the companies have to ask for government assistance because of overspending. Oddly for a research chief, he says "as a consumer, I feel frustrated when a product I have purchased is obsolete within three months because of all the innovations". In his interview, Roger Penrose, the Oxford mathematician, says "to avoid unnecessary scares, science communication needs a certain authority to place control over it" and that "the danger of an unequal spread of knowledge in society is, of course, not a new phenomenon. But I really think that some kind of effort is needed on a global scale to keep the process under control.... Such things should not be left to individuals". All these are unfamiliar notes to an American ear.

The most striking feature of the book is a remarkable lack of content, even after allowing for the deficiencies of its format and interviewers. How can fifteen people, eminent or interesting or both, be given 5–10 pages each on the topic of the changing role of science in society and say so little? Why are the standard questions not seized on and worried like a terrier with a rat? The role of big science, for example, and whether it is becoming just another pork-barrel constituency? Why are scientists always being called on for predictions, when their mana is so unsuitable for this task (half of the joy of science is shooting down your rivals' predictions, so that scientists too readily become absorbed into adversarial posturing on almost any topic)? Are there too many researchers and not enough scientists in government and industry? Why has the advance of science done nothing to diminish superstition?

Perhaps the reason that questions such as these are not approached by these opinion leaders is that there is no separable role for science and technology in modern society. They are omnipresent, taken for granted and in many ways invisible. Einstein was a cartoon figure, an eikon instantly recognizable, but nowadays no one would be expected to recognize Watson or Crick in a cartoon in a popular newspaper. The person that places the final piece in the puzzle of understanding the human brain (or, better, makes the final twist of the Rubik's cube so that the clear pattern can be seen) will be one of a cast of thousands, will have his fifteen minutes of fame and the technology will incrementally and imperceptibly be absorbed into daily living as it is developed.

In the book little distinction is made between science and technology; this is the general public feeling and it is probably sensible. Science is inextricably linked with technology; technology is remarkably good at diffusing and difficult to constrain. Metaphors from the field of evolution have been applied with some success to describe how scientific ideas develop through a process of selection of those that fit their environment best, and how new technologies "evolve" from existing technologies. Technologies that compete for the same niche can win on grounds that do not depend on scientific criteria alone. The bubble memory at one time looked likely to supersede the floppy disc in computers, but was overcome by economic factors; the floppy was already so far along its learning curve that the more elegant bubble memory could not replace it as a standard. There are so many fragments of science and technology floating around at any one time that schemes to improve the productivity of science (another favorite question, usually posed by someone who has no idea of how to measure the productivity in the first place) are not simple matters of "better management".

What does change the direction of science? New technology, more than anything. A new tool developed in one field rapidly produces new exploration and new insights in many other fields. A current example is DNA amplification. How does the world influence science? By changing the total amount of funding and by changing how people who enter science are perceived, as explorers or nerds or dangerous monomaniacs. Except for a few fields of "big science", surprisingly little occurs in the short run by changing the ostensible targets of funding agencies; scientists are expert at seeing a notice of a new funding source and hastening to their word-processors to refurbish grant applications with correctly applicable new goals and benefits for their currently cherished plan of research. An anthropologist is needed to disentangle the division of labor and control between scientists, supposedly chiefly motivated by the desire for prestige accorded by their peers (developed by the doctoral and post-doctoral boot-camps into as strange a form as the medieval concept of honor); the business community, at least partly driven by economic factors; and the world of politics, dominated by the drive for power, obtained by finding jobs and benefits for one's allies and resources for one's base of support.

How does scientific and technological change impact on the polity? Except in a few high-profile cases, it just happens and gets absorbed. If chaos theory and new architectures for computers were to result in weather forecasts totally accurate for four weeks ahead, there would be a shattering effect on many economic activities from tourism to farming, but there would be no specific time when "policy decisions" in the European sense would be made. Science and technology change the real world, and not just our understanding of it. The changes are incremental and incessant.

The role of science in society is thus complex, buried in custom, implicit and obscure. Perhaps the failure of the fifteen opinion leaders to be specific or to cover much common ground in their interviews simply reflects this status. It would have been as worthwhile to ask them for their views on life (in 5 pages).

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