

tion, where the Southern Ocean, its exploitation and its environmental protection, provide an intriguing area of legal overlap (V. Safronchuk).

The future is the territory of the final section of the book. There is little doubt that the system has gained considerable momentum since the treaty came into force in 1961. It has adapted to new needs, typically political, more recently environmental. The thirtieth anniversary of the signing of the treaty passed on 23 June 1991, since when it has been possible for consultative parties to seek overall review according to the treaty's initial provisions. With 186 wide-ranging recommendations already agreed at the biennial consultative meetings, the treaty is not ossified or stranded in the era of the Cold War or the International Geophysical Year, but is still contemporary and relevant. As outlined by O. Stokke, the system is a useful model for international cooperation in a wider context. Certainly it has demonstrated an

ability to survive and contribute to change. Yet problems remain. K. Mesner and R. Breth tackle the issue of the need for stronger institutionalization through the creation of a permanent secretariat, a *cause célèbre* that has dogged the system for many years.

Another detail requiring urgent attention is how to regulate tourism, which is having increasingly detrimental effects on the environment. The sinking of the *Bahia Paraiso* in 1989 off Palmer Station, where 81 tourists on board had visited US scientists, and the subsequent concern about oil pollution, were the direct result of mixing tourism with the resupply of government research stations. I. Nicholson reviews this area, discussing jurisdiction, legal arrangements, and environmental and safety problems. Finally, both R. Falk and W. Ostreng examine unresolved conflicts of interest within the system, as well as its long-term viability and possible alternatives to its procedures.

It is fitting to conclude that throughout the book the contributors recognize the outstanding success of the Antarctic Treaty System in keeping the peace, shielding crucial scientific research from erosion or manipulation, embracing political change and stimulating international cooperation. For those seeking a broad review of contemporary Antarctic affairs, the volume is thoroughly recommended. □

D. J. Drewry is Director of the British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, UK.

■ In a similar vein is *Antarctica and Global Climatic Change* edited by Colin Harris and Bernard Stonehouse, a volume arising from a 1990 British/New Zealand symposium. The book has 15 contributors, including D. J. Drewry, and is divided into three main sections: current state of knowledge; atmosphere, ice and ocean; and ecology and management responses. Published by Belhaven Press, price is £33. □

Dangerous liaisons

Robert L. Wesson

Earthquake Hazard Analysis: Issues and Insights By Leon Reiter. *Columbia University Press: 1991. Pp. 254. \$75.*

GLOBAL warming, the depletion of the ozone layer, toxic waste disposal, food and drugs, AIDS, aircraft and highways — all offer threats against which the citizens of democracies look to their governments for protection. All involve processes that are incompletely understood. And, commonly, the necessary regulatory decisions must be made by governments in a highly charged economic, political and social atmosphere. In this book, Reiter summarizes and assesses the body of techniques used to analyse the hazards posed by a phenomenon of particular concern — earthquakes. His intended audience ranges from scientists to lawyers, and his vantage point as a senior member of the US Nuclear Regulatory Commission (the body responsible for licensing commercial nuclear power reactors in the United States), together with his keen mind and capacity for independent thought, amply qualify him for the task.

The sensitivity of nuclear reactor sites to strong ground motion means that it is important to consider the possible consequences of earthquakes when designing reactors, even for areas of relatively low earthquake activity. The practice so far in the United States has been to design and license commercial reactors according to the hazard associated with

the site chosen. Regardless of whether this is good public policy, the practice has certainly led to a great deal of debate about the earthquake hazards at many sites. It has also produced a terrific growth in information and methods for analysing and describing the hazards. In his book, Reiter summarizes these in a most even-handed and insightful way.

Reiter takes an understated look at the sociology of the community that has arisen in the United States to deal with these issues: engineers who see themselves as the interpreters of reality, needing answers to solve today's problems; lawyers who see themselves as the resolvers of disputes; and scientists (seismologists and geologists) who see themselves as seekers of truth. As a member of the third cultural group, I must confess to mild horror at seeing our assumptions, compromises, inadequacies and lack of fundamental understanding of earthquakes accurately characterized throughout the book. It is fair, but it hurts. The image arises of an eighteenth-century physician, who although lacking understanding of disease is compelled to do something and so prescribes bleeding. But what to do? Scientists cannot expect society to stop in its tracks until the origins of, say, the 1886 earthquake in Charleston, South Carolina, are satisfactorily resolved. (It may well turn out that our failure to resolve this issue is not in fact the stumbling block to mitigating earthquake hazards on the eastern seaboard of the United States, even though I would argue that it is important.)

How are the nature and magnitude of earthquake hazards best characterized? Reiter lays out the methodologies, both deterministic and probabilistic, that have been developed to tackle the problem.

He also describes their seismological and engineering underpinnings, perhaps a little tediously for specialists, perhaps a little briefly for neophytes, but providing enough by way of an introduction. The many examples and applications as well as dilemmas that he describes in doing so are well chosen. The treatment does, however, require the degree of mathematical ability that is usually associated with a background in physical science or engineering, so it would take an exceptional lawyer to be at home here. But for those with the right credentials, the presentation is sufficiently self-contained for the main ideas to be rapidly grasped.

Specialists will find the book a useful assessment of the state of the art. And for those who have the right background and who are interested in the broader issue of hazard analysis in general, the book should prove to be an illuminating case study of one subdiscipline, and of the interplay between science and engineering. Most important is Reiter's commentary on the relative merits, roles and importance of the various approaches. As he states in conclusion: "Much is known about earthquakes and much is not. Seismic hazard analysis is most successful when it can effectively characterize this state of knowledge in those different ways needed by the society in which we live." □

Robert L. Wesson is in the Office of Earthquakes, Volcanoes, and Engineering, US Geological Survey, Reston, Virginia 22092, USA.

■ New from Kluwer is *Seismic Anisotropy in the Earth* by V. Babuska and M. Clara, an introduction for researchers and students in the fields of seismology, tectonophysics and geology. Price is Dfl.100, \$59, £37. □