

thermodynamics: for them it was just the everyday common or garden variety.

Despite these lacunae and numerous technical details which purists will dispute, Westerhoff and van Dam have presented bioenergeticists with an extraordinarily broad, if eclectic, compendium of well-integrated theoretical and experimental information, together with an alphabetical bibliography of nearly 700 references. The accounts of current work may become obsolete, but for the time being they are undoubtedly worthwhile contributions. Control theory has lacked a definitive textbook presentation, and although the sceptics will probably not be convinced by this one, it is comprehensive and gives them plenty to think about. All this may make the book attractive for libraries, but the individual scholar will ponder carefully before investing in it. His best bet is to borrow a copy, classify himself according to the eight categories of reader defined by the authors, and then to try navigating the route designated for him. Much of the mathematics and associated terminology will prove heavy going for biologists, although those with a physical bent should be stimulated to turn to the original sources for more complete treatments of topics like the diagram method.

The book is written in a lively style, is adequately indexed and has a helpful glossary of symbols, but would have benefited from thorough editing. It suffers from a surfeit of parentheses — for example on p.115 we find, "Noting that the (co)variance (matrix) of the equilibrium distribution is equal to (contains) the second derivatives of the (local) characteristic function . . .". This sentence also illustrates the level of mathematical expertise required. Many English-speaking readers will be disconcerted to find the pound sterling derogated to the role of a superscript, while the Gothic spelling of Gaussian looks decidedly odd. But these are forgivable shortcomings in an otherwise well-crafted product. □

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New in paperback

- *The Omega Point* by John Gribbin. Publisher is Corgi, price is £4.95, \$8.95. For review see *Nature* **330**, 294 (1987).
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- *Who Goes First? The Story of Self-Experimentation in Medicine* by L. K. Altman. Publisher is Equation, price is £8.99. For review see *Nature* **330**, 429 (1987).

A shock to the system

Peter D. Marshall

The Great Tangshan Earthquake of 1976: An Anatomy of Disaster. Edited by Chen Yong *et al.* Pergamon: 1988. Pp.153. £20, \$36.

ON 28 July 1976, a huge earthquake, 7.8 on the Richter scale, occurred beneath the Chinese city of Tangshan. Because the focus of the earthquake was shallow, the intensities within the immediate vicinity of the epicentre were extremely high and Tangshan, a large industrial city, was totally destroyed. The final casualty toll was horrendous — 240,000 people died and over 700,000 were injured. Such a catastrophe warrants thorough analysis. But although numerous studies have indeed been made of the scientific and socio-economic aspects of the Tangshan earthquake, most of them have been published in Chinese. This slender volume summarizes, in English, the salient points contained in the Chinese reports. The authors have done an excellent job, and have produced a first-class book.

The failure to predict the Tangshan earthquake must have been a big disappointment for Chinese seismologists, who only 18 months earlier had distinguished themselves by successfully predicting a magnitude 7.3 earthquake in the nearby Haicheng region of north-east China. This failure, in an area identified by the Chinese as "an earthquake-hazardous zone" that had been designated "for special attention as far as prediction is concerned", is dealt with in detail in the book. Although in retrospect it is possible to recognize numerous precursive indications which occurred one to two days before the main shock, they were in fact too few and too late to give the scientists a chance of making any forecast. This highlights the difficulties of earthquake prediction; the large variety of triggering mechanisms is such that sometimes there will be precursive phenomena and sometimes not. As the authors point out, "by bluntly expecting the Tangshan case to duplicate the example of the Haicheng pattern, the prediction attempt was doomed at the very outset".

The text is divided into four chapters. Each of them can be read without reference to the others, which means that the book will be of easy use both to those in disaster relief agencies and to scientists. Chapter 1 describes the destruction of the socio-economic infrastructure and the civil engineering aspects, and Chapter 2 the human aspects and the rescue details. The other two chapters are more scientific in content, and are concerned with seis-

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REASONS

Living on the edge — the tractor of the Daodi Commune, Fengnan County, was a victim of the earthquake.

mology and earthquake prediction. Here, important questions are raised which will need to be resolved if the science of prediction is to be taken seriously.

All six of the authors are members of China's State Seismological Bureau. They were all on the disaster scene within hours of the main shock and were eyewitnesses to the devastation. They participated in the rescue work and in the reconstruction of Tangshan, and were obviously deeply affected by what they saw.

But this is not just a horror story; rather it is a very valuable chronicle of what actually happens during and after a major and damaging earthquake. Most particularly, there are many lessons to be learned from it on how to respond to the immediate needs of the victims — to be sure, few nations could have dealt with such a catastrophe as effectively and efficiently as the Chinese. □

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