"The 'Cattle Nuisance' was, as in this London scene, an integral part of Victorian urban life and contributed to the excitement and odour of the city as well as to the traffic congestion." [Reproduced in *Endangered Lives* from *The Graphic*, 27 Jan. 1877; Guildhall Library]

delayed until the last quarter of the century. To implement preventive measures the Victorians relied on the initiative of hundreds of local authorities, who all too often reflected the interests of slum landlords and of polluting industries, as well as of small rate payers. Serious efforts in public health began only when the local authority appointed a medical officer of health. Although the first of these officers were appointed in 1847 and 1848, only about 50 had been appointed by 1872, when their appointment was made compulsory. By the end of 1877 there were 1206 such appointees. Widespread local administrative effort, then, only began in the 1870's. Even then, low salaries meant that most medical officers of health were part-time, and their positions were not secure.

Consider also the way in which the Victorians' major achievement in public health, regional drainage schemes, was effected. In the early and middle 1840's reformers like Chadwick had demanded water-suspended, comprehensive sewage systems as essential to the public health enterprise. By the end of that decade legislation was passed that enabled towns to construct such systems. Although bold and vastly expensive drainage works were constructed in some places, most towns lacked the capital, the experience, the technical advice, the abundant supply of water, and, most important, the will to adopt such costly and untried methods. Such towns were content to drain cesspools and to rely on dry conservancy, the pail system, for the removal of human excrement from most of their homes. It was not the sewer system but the pail system, an offensive half-measure, that dominated municipal health activity throughout most of the second half of the 19th century. As late as 1911, two-thirds of working-class homes in Manchester were still without water closets. A painfully long period of time was required to effectively apply preventive measures on a great scale. This is a fact relevant to current historical debates about whether conscious human effort had much to do with the fall in mortality during the 19th century.

In conclusion this is a welcome book: stimulating, intelligent, balanced. By emphasizing ordinary conditions of life rather than the exceptional circumstances of epidemics, by considering the provinces as well as London, by studying routine services and administration as well as innovative ideas and ideal solutions, and finally by undertaking a genuinely comprehensive synthesis, Wohl has enriched our understanding of Victorian public health.

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Geomagnetism

The Earth's Core. Its Structure, Evolution and Magnetic Field. Proceedings of a meeting, Jan. 1982. S. K. RUNCORN, K. M. CREER, and J. A. JACOBS, Eds. The Royal Society, London, 1982. viii, 290 pp., illus. £37.50. First published in *Philosophical Transactions of the Royal Society of London*, series A, vol. 306.

The existence of a dense fluid core in the earth has been established for over 50 years. The core remains one of the foremost subjects the earth scientist must tackle in order to understand the behavior of our planet.

This book is a collection of papers presented at a conference in honor of the sesquicentenary of Gauss's first measurement of the geomagnetic field intensity. Perhaps as a consequence the papers are heavily biased toward geomagnetism, though other fields are represented.

Some important information has been accumulated during the last five years. Observations of melting iron in shock-wave experiments have constrained the phase diagram of iron, the dominant constituent of the core. (The consequences of these observations for our understanding of the thermal structure of the core are discussed in this volume by O. L. Anderson.) The density of the liquid outer core is, however, significantly less than that of pure iron, and the nature of the light alloying components is tackled in an excellent review by T. J. Ahrens. Ahrens reports that there is mounting evidence that there are not significant amounts of potassium in the core. This removes a possible source of energy for the driving of convective motions in the fluid (and thus for the maintenance of a magnetic field by dynamo action). An alternative energy source must be found; gravitational energy release due to the evolution of a solid inner core is a possibility.

Our knowledge of the morphology of the geomagnetic field in historical and prehistorical times has improved, and there are contributions in the book on the secular variation of the field, the chronology of reversals, and the detailed structure of the field during reversals. I was surprised to find that the evidence for geomagnetic excursions (aborted reversals) is under scrutiny and that reexamination suggests that the excursions may be local, rather than global, variations of the field. Papers by K. A. Whaler and D. Gubbins describe progress in delineating fluid flow near the top of the core as inferred from the present-day field. Clearly all these observations pro-

vide constraints on the regeneration mechanism of the field; however, progress on this aspect of the subject has been slow. R. Hide gives a useful review of the expected forms of fluid motion, and F. Krause discusses some results from mean-field electrodynamics. Krause finds that the associated ohmic dissipation is an important constraint on the length and time scales of the convective cells.

This brief tour demonstrates the book's diversity. No editorial attempt has been made to integrate the results of different fields. Many of the papers in the book are reports of research and not reviews. These features make the book inappropriate for teaching purposes. It does, however, provide an excellent entry to the modern literature on most aspects of the earth's core as well as some stimulating papers.

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Seismology

Earthquake Forecasting and Warning. TSUNEJI RIKITAKE. Center for Academic Publications Japan, Tokyo, and Reidel, Boston, 1983 (distributor, Kluwer Boston, Hingham, Mass.). xxii, 402 pp., illus. $45. Developments in Earth and Planetary Science, 03.

This is the third book in a series produced by Rikitake. In 1976, *Earthquake Prediction*, written entirely by Rikitake, provided the first comprehensive overview of initial earthquake prediction efforts in Japan, China, the Soviet Union, and the United States. The book provided a summary of theories of earthquake prediction and the observational data existing at that time that suggested that large earthquakes were indeed predictable. *Current Research in Earthquake Prediction I*, partly written by Rikitake, appeared in 1981. It covered various aspects of the Japanese earthquake prediction program, with two brief sections on U.S. activities. In this third book, Rikitake attempts to update the status of earthquake prediction efforts in Japan, China, the Soviet Union and the United States; to give an overview of some of the organizational, legal, and societal aspects of earthquake prediction in these four countries; and to update scientific findings of precursory phenomena.

For scientists interested in earthquake prediction the most important contribution of the book is the summary of the circumstances surrounding the 1975 Haicheng earthquake (magnitude 7.3), the 1978 Tangshan earthquake (magnitude 7.8), and the 1976 Songpan-Pingwu earthquake (magnitudes 7.2, 6.8, 7.2) in China and the 1978 Izu-Oshima earthquake (magnitude 7.0) in Japan. As a result of several trips to China, Rikitake is able to provide insightful reports about the successful short-term predictions of the Haicheng and Songpan-Pingwu earthquakes (which probably saved several tens of thousands of lives) and the nonprediction of the Tangshan earthquake (in which 244,000 people died according to official estimates—unofficial estimates are as high as 655,000). The summaries of earthquake precursory phenomena manage to leave the reader both fascinated and perplexed, for few "hard" scientific data are actually available. Successful predictions notwithstanding, both Rikitake and the reader are forced to admit that because Chinese seismologists depend heavily upon nonscientifically sampled "macroscopic anomalies" (unusual animal behavior, water-well fluctuations, natural gas emissions, and the like) it is still nearly impossible to understand their prediction criteria.

It is unfortunate that this book fails to provide a comprehensive summary of recent advances in earthquake prediction research. Though some recent progress in Japan is cited, the significant advances made in the United States since 1979 in earthquake recurrence estimates and crustal deformation and seismicity monitoring are not covered at all. For example, on the subject of crustal deformation measurements, the author refers to several papers published over 12 years ago but totally disregards over a score of publications in the last decade that establish deformation and slip rates along the San Andreas fault zone. It is also regrettable that the only evidence offered of progress in earthquake prediction is various types of data collected over a short period preceding an earthquake, types of data that have become familiar over the years. The definition of specific seismic gaps and the quantitative assessment of earthquake probabilities, the development of detailed observation systems, and the determination of long-term rates of seismicity and crustal deformation are all significant accomplishments that readers will be unable to assess.

The exact form earthquake prediction information should take for effective transmission to the public and the public response to such information are extremely important topics that are each the subject of a chapter in the book. The Japanese experience with these issues provides important insight. Also of interest is the summary of the circumstances surrounding the "Ishibashi hypothesis." In this case a mild panic occurred owing to the misinterpretation of a reasonable scientific hypothesis about the area that would be affected by a repeat occurrence of a great earthquake that occurred in 1854. This case reminds us of the difficult task we face in maintaining scientifically credible earthquake prediction research efforts in the face of possibly extreme public pressure for up-to-date information.

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'Autistic' Children. New Hope for a Cure. Niko

(Continued on page 337)