time to include all the principles in this book, which has a 1991 publication date. In fact, a general feature of the book is that most of the cited references are pre-1987; there are only a few 1988. This is curious; it should not take three years to publish a book. Indeed, in addition to the content, the book has a very dated, early 1980s look about it. The old-fashioned single-column layout used results in much wasted space — a two-column format would have been more attractive and would have given flexibility for figures, photos, captions and tables. Similarly, it is a shame that the authors did not spend more effort to get their own photographs and devise new figures rather than borrowing from other people's work. Many of the figures that are used are specific examples of a feature containing too much local information and lacking explanatory text. The inclusion of an author index in a book of this type is worthless, except perhaps to academics looking for citations of their own work. Another irritating feature of the book is that each chapter has its own reference list; students much prefer a single bibliography which wastes less space and is easier to use.

Principles of Stratigraphic Analysis does contain some useful material but an opportunity has been lost to make it the stratigraphy text for the 1990s. It is also far too expensive for British undergraduates to buy, and presumably North American students too. There should have been more consultation during the preparation of the book and stronger editorial control. The jacket design is brilliant. □

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A cause for concern

R.W. Battarbee

Acid Rain and Acid Waters. By Gwyneth Howells. *Ellis Horwood/Prentice Hall: 1990. Pp.214. £39.95, $79.95.*

In *Acid Rain and Acid Waters* Gwyneth Howells refers to acid rain as a *cause célèbre* and one that since 1972 after two decades of intense research has "generated much heat, but not a great deal of light". Most scientists involved in the acid-rain debate would disagree but I know what she means.

Until recently Dr Howells was head of biology at the UK Central Electricity Generating Board's research laboratories directing a comprehensive research programme on acid deposition and its effects. She became a leading and much respected scientist on the acid-rain circuit, representing and effectively defending the interests of the power generating industry. As a consequence she has acquired a substantial knowledge of the disparate specialist sciences involved in this complex issue much of which is distilled in this book.

The book aims to give a scientific review of acid rain and its effects, using examples from both Europe and North America. It covers emissions, transformations, deposition of acidity, and the effects of acid deposition on vegetation, soils, water quality and aquatic biology, and includes a chapter on reversibility. Each chapter presents an extensively referenced literature review and finishes with a list of unresolved issues and a summary of principal findings.

Much of the material is of a factual nature, and, except for the curious decision to ignore some of the excellent work carried out in Britain, it is presented in a relatively straightforward way. At the heart of the book is the debate which has caused passions to run high over the last 15 years or so: the extent to which problems of surface-water acidification are due to acid rain. The general public, and indeed many scientists, may not be aware of the vigour with which alternative hypotheses, chiefly concerning the roles of natural acidification processes and land-use changes, have been put forward. These alternative explanations have been understandably espoused and promoted by power generating utilities both in Britain and the United States.

It is in this politically important area that the book is most seriously flawed. Despite protestations that she is taking an "objective stance" based on the "scientific peer-reviewed literature" the author has clear sympathies, and uses the literature selectively to foster those sympathies. For example, in an attempt to minimize the extent of acidified waters in Britain, data collated by the UK Acid Waters Review Group are presented for the measured pH change of rivers between 1970 and 1984. The author states that "a searching analysis of 75 data sets for monitored river sites in susceptible areas has shown that a trend of increasing acidity for the 10 years prior to 1986 could be found in only six". But it is not pointed out, as members of that Review Group acknowledge, that all the monitoring sites were in the nonsensitive lowland reaches of the rivers (some had pH >8), and that in any event no decrease should be expected because acid emissions in the Britain were falling during that period.

Nevertheless, despite these biases there is a clearly stated general acceptance of the damage caused by acid deposition to sensitive ecosystems, and the penultimate chapter of the book is consequently devoted to a consideration of reversibility and recovery strategies. Here the author is of the opinion that emission control "will have limited benefit, especially within the next century" because of long-term depletion of base status and the historical accumulation of sulphur in soils. Strangely, the field evidence she cites in the chapter does not support this conclusion which suggests that lakes can respond rapidly to a reduction in acid deposition. Instead she prefers the evidence for a slow response derived from the forecasts of process-based models. This preference allows the author to argue, with some zeal, for liming as an alternative restoration strategy. Unfortunately the disadvantages of liming, such as the additional ecological damage liming can cause and the need to repeat liming frequently, are not discussed.

In her conclusion then the author is in favour of only a modest amount of emission reduction, and, in her promotion of liming and catchment management, is dismissive of the ecological need to protect biotic diversity and restore natural communities. Moreover, in focusing only on a solution to the surface-water problem her conclusions myopically fail to embrace the wider environmental benefits of reducing acid emissions in particular and energy generated from fossil fuels in general.

Acid Rain and Acid Water is a disappointing book, strong on facts and figures, but not really reaching the heights of scientific clarity and objectivity aspired to in the opening exchanges. □

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Greenpeace

Trees stripped bare — a forest in Czechoslovakia showing extensive damage as a result of acid rain.

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