

Book reviews

Chemical Oceanography, 2nd edition, by Frank J. Millero (CRC Press, 1996). ISBN 0-8493-8423-0. \$135.00.

Millero is a distinguished chemical oceanographer. In 1992 he published *Chemical Oceanography* because he felt that the textbooks *Marine Chemistry* by Horne and *Introduction to Marine Chemistry* by Riley and Chester had become outdated, but that students could not follow *Tracers in the Sea* by Broecker and Peng. I sympathise with his students and share their sentiments. I also envy them at having obtained such an interesting and readable book. I like it. It is a worthy successor to Horne.

This second edition is an updated version. The chapter on organic chemistry has been deleted and more recent concerns – such as the iron hypothesis – have been added. It has ten chapters, whose titles are: descriptive oceanography, composition of the major components of seawater, minor components of seawater, ionic interactions, atmospheric chemistry, dissolved gases other than CO₂, the carbonate system, micronutrients and the oceans, primary production in the oceans, and processes in the oceans.

Not all that long ago I had occasion to look at another book on a similar topic, *Aquatic Chemistry Concepts* (Pankow 1991). I found it difficult to understand and not enjoyable to read. The contrast with Millero's book was sufficiently marked that I wondered what it was that set the two apart. Pankow is a book written for the physical chemist with an interest in the theoretical aspects of the aqueous state. By contrast, Millero ties both his descriptions and his theory to oceanic observations.

There is also probably another reason for my preference for Millero. You will notice, from the list of chapters, that he has included atmospheric chemistry. This is an unusual feature in a book on chemical oceanography. Millero explains that 'since the oceans are in intimate contact with the atmosphere and may act as a source or sink for atmospheric gases, it is appropriate to briefly examine this area of science'. The scientific sentiment is to be commended. The split infinitive is probably best overlooked.

There is much to write about in 469 pages. The last entry on page 469 is the index item to zirconium, on page 429. Why would a book on oceanography have an index entry on zirconium? The answer is over-zealous indexing. Page 429 has a table of atomic weights of the elements. Each element thus gets indexed and referred to this page. We do better with oxygen. In addition to

the obligatory reference to page 429, the index dutifully refers to pages 219-229 where one finds a long description of dissolved oxygen in seawater, including an explanation of the Winkler method of measurement. Unfortunately the index will not help you to find the formula for dissolved oxygen as a function of temperature. It is on page 209 in the section called dissolution of gases in seawater.

What about the extreme opposite to dissolved oxygen – namely anoxic basins? They are succinctly mentioned on page 92, and described in detail on pages 389-427. Anoxic basins contain thriving bacteria that produce H₂S. More fascinating are the bacteria near deep sea hydrothermal vents that oxidise the H₂S from the vents to produce energy to make organic compounds. Fifteen pages are devoted to hydrothermal vents.

The book appealed to me. It covers the topics about which I am likely to want guidance. And it does so in an understandable way.

Tom Beer

Tom Beer is the author of Environmental Oceanography, the second edition of which is to be published by CRC Press in early 1997.

Frost Bytes by Pene Greet and Gina Price (Doubleday, 1995). ISBN 0-86824-554-2. \$22.95.

The experiences of women living and working in what are considered remote and extreme environments, together with the fact the work is upper atmospheric physics, combine to make *Frost Bytes* both an unusual and a gripping book. Both authors were born in the same year, and met in 1983 while studying at the Mawson Institute for Antarctic Research at the University of Adelaide. Each spent a year undertaking research at Mawson: Gina in the winter of 1985, Pene in 1988. They shared their work, especially since both used a Fabry-Perot spectrometer for their research, Gina's on auroral events, especially the green oxygen emission (the dominant feature of the aurora), and Pene's on the emission from a layer of neutral sodium atoms near 90 km altitude. Both completed their PhDs in 1988. Work led to friendship, and as the book shows,

a decade's interweaving of their lives.

The book is developed around the e-mail letters they exchanged during Pene's year at Mawson, when Gina was undertaking further upper atmospheric research at Siding Springs, near Fairbanks, Alaska. However, the book is more than just the letters, for in their actual content, as well as the text which introduces, links them and reflects on them, we find a rich tapestry of events and issues, friendships, loves and disappointments, careers and discoveries about living.

For some readers, *Frost Bytes* will be predominantly the story of Pene's year at Mawson, and her two previous summer visits to Antarctica, and of Gina's time in Alaska as she wrestles with urgent career and personal issues. Pene speaks out with intense personal honesty and great integrity about the 'inner and outer struggles' of being the only woman, and a scientist ('boffin') at that, on an Australian Antarctic station over winter. Her courage is great in telling her story 'warts and all', in particular the male attitudes towards women in general, the illegal display of pornography, the baiting and ongoing pressures, not least when she develops a partnership with Paul. In turn, this reminds Gina of issues from her time there, and of the subsequent contrasts now that she is living in a community in Alaska with a strong circle of women, though facing some similar personal issues.

For many women who have been to Antarctica, the book is a release: through naming and telling the experience, it legitimates those often-hidden hurts and confusions that some carry for years after the experience. For others, for whom the book does not cover common ground, there may be concern at the bold 'exposure' of what can be experienced between expeditioners. Through Gina's responses, it is possible to see one woman's experience in a larger context, and reflect on the implications for women – and men – of a group mixed on many dimensions sharing the isolation of an Antarctic winter.

The book has far wider appeal, important as the discussion of harassment is. For it also celebrates the lives of two fit young women who love the wild places of this earth, alert to the changing seasons and the ramifications in those latitudes for human activity. It presents the joy of working with the huskies in Antarctica, especially preparing for the long run to Kloa emperor penguin rookery in which each participated; of mushing and ski-joring in Alaska as a continuation of that intense experience of the elements; and of the beauty of both places. For Gina, there is a time of new experiences of positive human community, and a questioning of priorities.

In their interchange about physics, they share their intense fascination with this way of knowing the universe, and their delight in the phenomena their instrument reveals is tempered by concern with the sacrifice of so much to pursue a high-profile research career. And

as they lose, develop, rejoice and agonise over relationships – and tragically, Pene's friend Paul dies from cancer on their return – they also tell much about women's longings, fears and joys.

This book is a treat for those interested in the human side of science, and in the possibilities for women's lives. The setting – Antarctic and Alaska – provides a special touch of excitement. The issues explored in the two friends' correspondence, covering both the outward and the inward journeys, makes this an adventure book which will appeal on many levels, and a must for those who travel both physically and in spirit. References and a glossary help to make this lively, well-written book accessible to a wide audience.

Robin Burns

Robin Burns, a social scientist at La Trobe University, spent the 1995/6 summer doing a research project at Casey. She is writing a book on women who have been to Antarctica.

Air Pollution IV: Monitoring, Simulation and Control edited by B. Caussade, H. Power and C.A. Brebbia (Computational Mechanics Publications, 1996). ISBN 1-8531-2422-2. £245.00/US\$368.00.

Air Pollution IV: Monitoring, Simulation and Control is a book containing part of the proceedings of the Fourth International Conference on Air Pollution Monitoring, Simulation and Control, held in Toulouse, France, 28-30 August 1996.

The book is divided into twelve sections which cover measurement, data analysis, and modelling in areas such as emissions, meteorology, turbulence, chemistry, aerosols, and radiation. Also included are some papers on fluid mechanics, process studies, pollution engineering and pollution management. It is quite a long book (869 pages) and there are 97 separate papers. The papers are short and generally not much detail is contained in each, but references can be used as a further reading guide. As you would expect given the location of the conference, the majority of authors were from Europe, although I did notice two papers with Australian authors, on acid deposition (Bridgeman) and ozone (Anh, Lunney, Best, Johnson, Azzi, and Duc).

The book contains a wide range of papers on the application of techniques to particular air pollution problems – a reader working in this field would proba-

bly find quite a few interesting. Not many of the papers were concerned with the development of new methodologies or techniques for treating air pollution problems, but rather with the application of existing methods to local problems. There is a good mix of studies relevant to both industrial and urban pollution. The majority of the papers are concerned with small or mesoscale phenomena, but there are some that look at the global scale, or at effects which are potentially relevant to this scale, such as the feedback mechanism of pollution and aerosols on climate. Some studies also look at long range transport, particularly for acid deposition studies.

Sections 1, 2, 5, and 8 contain some of the more fundamental flow and turbulence measurement/modelling papers as applied to non-reactive gases, and due to my background I found some of these papers interesting. Sections 3 and 4 look at air pollution chemistry and include some interesting work on the interaction of cloud water with pollutants. Section 6 includes some material which examines both aerosol formation in clouds and the feedback effect of these aerosols on radiation and temperature. Sections 9-11 contain papers relevant to airshed measurement and modelling for urban

areas and concentrate on emission sources relevant to photochemically active gases. Sections 12-13 examine air pollution management strategies for areas such as the United Kingdom, Denmark and Hong Kong.

A general problem with books such as this, which are based on conference proceedings, is that the papers have not been through an external review process, and so the papers vary in quality in terms of presentation, grammar, and scientific content.

The book is quite expensive (US\$380) and I do not recommend buying your own personal copy, but if your institution or company is involved in the air pollution field, then it may worth getting your library to buy one. The trouble is that more and more conferences are producing books such as these, and it is not practical to buy them all.

Peter Hurley

Peter Hurley is a senior research scientist at CSIRO Division of Atmospheric Research. His research interests include air pollution modelling, turbulence, and mesoscale flow.

