Tying up the threads

T. L. Killeen

Physics and Chemistry of the Upper Atmosphere. By M. H. Rees. *Cambridge University Press: 1989. Pp.289. Hbk £40, $80; pbk £15, $27.95.*

THE study of the Earth's upper atmosphere, by its very nature, requires an interdisciplinary approach, using tools from many fields of chemistry and physics, including photochemistry, spectroscopy, thermodynamics, fluid mechanics, gas kinetic theory, radiative transfer, plasma physics and optics. Perhaps because of this exciting confluence, available textbooks sometimes over-emphasize one or another area to the detriment of the rest, or provide too much or too little detail for teaching purposes. As a consequence, teachers of university courses have had to select material from various books. M. H. Rees of the University of Alaska has attempted to remedy this deficiency. The task he has set himself is difficult, and one for which there are many possible approaches and pitfalls. In general, his attempt to provide a single comprehensive text is successful, and his book represents an important addition to the literature.

Although the title is all-encompassing, Rees sensibly limits the scope of his book to a discussion of those parts of the upper atmosphere termed the thermosphere and ionosphere. Rees has made many important original contributions in this field and has an obvious and impressive mastery of the theoretical development. Accordingly, his treatment of the relevant physical and chemical processes is thorough and expertly presented, although few fundamental derivations from first principles are given. He discusses key equations and concepts clearly, makes excellent use of recent research, and ends each chapter with a set of thought-provoking (and far-reaching) problems for the reader.

As might be expected from a leading authority on the aurora, the section on the effects on the thermosphere and ionosphere of precipitating particles and solar photons is particularly useful. There is also a valuable chapter on dynamics that is unique in its comprehensive discussion of both the theory and the recent experimental advances. In general, the book works well as a reference text for both senior postgraduate students and specialized researchers, nicely filling a gap in the literature. □

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Happy birthday

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Molecular Biology: A Selection of Papers. Compiled by S. Brenner. *Academic: 1989. Pp. 622. Pbk £15.95, $29.95.*

WAS Balzac the first to make the age of thirty a subject for literary celebration? His *Femme de Trente Ans* describes a lady who has been through the pains and pleasures of youth embarking on a new stage of her life as she turns thirty. The *Journal of Molecular Biology*, known as *JMB* to its many friends, was founded by John Kendrew in 1959 and has now reached balzacian age. Its anniversary is celebrated in a book where some of the best papers are collected. Compiled by the present editor-in-chief, Sydney Brenner, it extends from 1959 to 1975 and covers 100 volumes of the journal. The selection of 38 papers among several thousands must have been very difficult, for which Brenner takes full responsibility. As the texts included are superb and well-worth reading even a quarter of century after they appeared, he can be blamed only for the inevitable omissions.

What was molecular biology in the 1960s and early 1970s? A selection of *JMB* papers should answer this question. Undoubtedly, molecular biology was then the biology of *Escherichia coli* and its phages, and more than half of the papers reprinted here deal with their genetics. The big move towards eukaryotes had just started in 1975, where the selection stops. More surprisingly, the favourite molecule of molecular biology seems to have been transfer DNA rather than a protein or even DNA. Full papers are devoted to two tRNAs, and when the DNA era started, the first paper is on the synthesis of the alanine tRNA gene by Khorana and collaborators in 1972. No protein is given much credit, save perhaps alpha-chymotrypsin, whose three-dimensional structure and mechanism were described by Blow and collaborators in 1968.

The absence of immunology and of developmental biology reminds us that these fields turned molecular only in the late 1970s. Structural studies, on the other hand, have been fundamental to molecular biology from the start. The book includes several major papers in electron microscopy, covering progress of the technique from early work on muscle and viruses to the advent of high-resolution models of unstained specimens in 1975. Good reprints of electron micrographs, which still strike the eye, are one of the best features of the book. By contrast, the role *JMB* played in protein crystallography is hardly apparent. The journal has been (and still is) the chief journal of protein crystallography. Crystallographers were actively publishing protein structures in the seventies, yet only one paper is reprinted here, that on alpha-chymotrypsin. Is this because crystallography papers carried none of the aesthetic and little of the scientific value of the structures they described? They certainly used to be illustrated by rather unintelligible diagrams in black and white, with stereo pairs that were difficult to see in three dimensions. Protein structures became popular only with the advent of sophisticated computer graphics.

The book makes it clear that *JMB* in the 1960s was very much a family affair. The journal's home was in Cambridge at the MRC Laboratory of Molecular Biology, where John Kendrew and Sydney Brenner worked together with many of its most prestigious authors. No less than 16 of the 38 papers selected by Brenner originate from the Cambridge lab. They include Nobel prizewinning reports by Aaron Klug on the electron microscopy of viruses and by Fred Sanger on nucleic-acid sequencing, and also four fine papers by Brenner himself and his collaborators. Some of us may remember that molecular biology had a few strongholds outside Cambridge. Only two are prominent in the selection: the Pasteur Institute, with several papers by Jacob and Monod, and the Biological Laboratories at Harvard, with Meselson, Ptashne and others. The rest of the world is too sparsely represented. Still, I was glad to find Cairns's famous images of the *E. coli* chromosome among the highlights of 1963.

Brenner's highly personal selection

New in paperback

■ *Neural Darwinism: The Theory of Neuronal Group Selection* is published in the United Kingdom today (8 March) in paperback by Oxford University Press, price £9.95. For review see *Nature* **331**, 571; 1988. Edelman's most recent book, *The Remembered Present*, was reviewed by Edward S. Reed in *Nature* **343**, 603; 15 February 1990.

■ Two books on quanta have recently been issued in paperback. *Are Quanta Real*, by J.M. Jauch, contains a new foreward by Douglas R. Hofstadter. First published in 1973, Jausch's book is a "Galilean dialogue", using three characters to represent different viewpoints of the physics and philosophy of quantum mechanics. Publishers are Indiana University Press, price is $7.95. *Atoms and Quanta* by Daphne F. Jackson is an undergraduate introduction to quantum mechanics. Published by Surrey University Press, price £15.95; $29.95.

■ Two new publications in the IRL Press series *Frontiers in Molecular Biology*, edited by D.M. Glover and B.D. Haines, are *Oncogenes*, published on 18 January, and *Molecular Neurobiology*, published on 15 February. Prices are £18; $38 for each volume.

■ In *The Threatening Desert*, Alan Grainger discusses causes of desertification and strategies for its control. The publisher is Earthscan, price is £9.95.