Space for the physics of plasmas

C.T. Russell

Magnetospheric Plasma Physics.
Edited by Atsuhiro Nishida.
Reidel: 1982. Pp.344. DG130, $49.50.

SPACE plasma physics is a mature, yet dynamic, field of investigation. In such a situation preparing a book presents considerable difficulties. There are very few individuals who have a broad yet deep enough understanding of each area to cover the field by themselves, while conference proceedings are usually uneven and incomplete.

For this volume the editor has chosen an intermediate approach, selecting a small number of the key researchers to write a coordinated set of reviews. Thus each topic can be treated in the appropriate depth and the entire field can be covered. As a result, this book is clearly the best currently available account of magnetospheric plasma physics. It is, however, not without flaws. Some important aspects of the subject are completely omitted, and the style and level of each chapter is variable.

The book consists of five chapters, the two best of which are by G. Haerendel and G. Paschmann on the interaction of the solar wind with the dayside magnetosphere and by C.F. Kennel and M. Ashour-Abdalla on electrostatic waves and strong diffusion of magnetospheric electrons. These contributions comprise almost 60 per cent of the text, and in themselves justify the book's purchase. They cover their subject well and will be useful to the advanced graduate student and the specialist alike.

By contrast A.A. Galeev's chapter on magnetospheric tail dynamics, while also very good, is written on too sophisticated a level for most of whom I judge to be the potential readers of this volume. Furthermore, despite the title of the chapter, the author concentrates on the microphysical processes which are probably the consequence of the global macroscopic dynamical instability of the magnetosphere–magnetotail system.

The contribution on auroral physics by T. Sato is principally concerned with field-aligned currents and double layers, two elements of auroral physics but far from the complete story. Sato omits consideration of all wave phenomena except for a few brief remarks on auroral kilometric radiation and ion acoustic solitons. The generation of ion conics is not even mentioned. The last chapter — on the origin of magnetospheric plasma — discusses the origin of the thermal plasma of the Earth and Jupiter, i.e. the ionosphere for Earth and Io for Jupiter. However the author ignores the solar wind source almost completely and particularly the role of convection in the outer magnetosphere in removing the upwelling thermal plasma from the ionosphere. Finally, no one seems to have been assigned the task of treating electromagnetic radiation or ULF waves; Chorus is not even mentioned in the book and the Kelvin–Helmholtz instability, kinetic Alfven waves and ion cyclotron resonance only get passing reference.

This, then, is a good book but not a complete one. However, even the weaker chapters have good bibliographies and the inclusion of a subject index makes the book easy to use as a reference source. □

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Computer anecdotes

Simon Lavington

Breakthrough to the Computer Age.
By Harry Wulforst.
Charles Scribner's Sons: 1982. Pp.185. $12.95.

COMPUTER history is sufficiently recent for there to be a strong anecdotal tradition which contrasts with the analytical treatment of the serious historian. There is, however, a need for both approaches. Whilst the analyst quite rightly attempts to define trends, chart influences and pinpoint "firsts", the fact of the matter is that many early computer research groups proceeded in an *ad hoc* and relatively independent way, inventing techniques as the need arose. There was, of course, interaction and cross-fertilization but there were also personality clashes, commercial exploitation and political infighting which militated against close cooperation. *Breakthrough to the Computer Age* leans heavily towards the anecdotal and is not much the worse for that.

Harry Wulforst is a former director of public information for Sperry Univac and his book lives up to his job description. He reveals for public inspection the hitherto blurred story of the American computer pioneers J. Presper Eckert and John Mauchly, and their progression from the huge ENIAC electronic calculator, via the BINAC project, to the first UNIVAC commercial computer. It is a tale which highlights the years 1943–1951, spanning the transistion from war to precarious peace and, as far as computers go, the transition from experimentation to precarious production. For the computer historian this period is still to some extent fogged by the mists of military security and commercial sensitivity.

Mr Wulforst is at his most useful when clearing away the latter haze. He describes the financial growing pains of the infant Eckert–Mauchly computer company and its eventual takeover by Remington–Rand. There is the element of technological bluff in the delivery deadline quoted by Eckert–Mauchly for their BINAC computer, their attempts to get capital from sources as bizarre as the American Totalisator Co., and the eventual trouncing of their detractors when the first UNIVAC machine was delivered to the US Bureau of the Census in the spring of 1951. If all this can be described as a "breakthrough", then it is in the sense of a credibility breakthrough: Eckert and Mauchly became convinced of the usefulness of general purpose computers and then struggled hard to convince the paying public.

Turning to the analytical view of history, Mr Wulforst must be taken to task. He fails to appreciate the important conceptual difference between special-purpose computers such as ENIAC and general purpose stored-program computers such as BINAC and UNIVAC. To dwell on such technicalities would, however, have spoilt his breakthrough theme because he would have become involved in a serious treatment of non-American computer projects and, oh dear, a realization that the United States was not the first in the field. What little coverage he gives to other computer developments is in parts actually misleading. It is also thrown in so haphazardly that it disturbs the book's main story. But here there is a hidden parable: to Eckert and Mauchly working under great pressure in the late 1940s the activities of other computer design teams were largely irrelevant. So also with Mr Wulforst.

So let the anecdotes have the last word. There are two gems from the book which, in their different ways, have a message of encouragement for today's design teams. The first comes from the eminent mathematician John von Neumann who, in 1945, was lobbying the Navy Department in Washington for government support for building a high-speed computer at the Institute for Advanced Study, Princeton University. He said, "A group which *builds* a computer is vastly better qualified to explore its possibilities experimentally than one which obtains it readymade". The second quotation comes from Howard Aiken, a well-respected computer pioneer whose work at Harvard preceded the Eckert–Mauchly enterprises. In 1950 Aiken was of the opinion that "no more than six computers would ever be sold in the commercial market". □

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American Antarctica

Antarctic Wildlife, with photographs by Eric Hosking and text by Bryan Sage, has just become available in the United States. Publisher is Facts on File, price $22.95. For review see *Nature* **300**, 556 (1982).