Saturn celebration

D.J. Southwood

Saturn.
Edited by Tom Gehrels and Mildred Shapley Matthews.
University of Arizona Press: 1984. Pp. 968. $37.50.

FOR many years planetary science was at the core of astronomy. In the early and middle parts of the twentieth century it drifted to the periphery, but then returned to the centre of public perception of the subject with the advent of the space era. A peak of interest must have been achieved with the Voyager encounters with Jupiter and Saturn in 1979–1981. One worries now that the sense of wonder seems to have been lost. Whether any mission will return to the Saturnian system before the next century must be doubtful. In such a light a book entitled *Saturn* must be looked at with interest. But while it may need to remain in print for a long while, will it remain in demand?

In a scientific research environment where the future is financially uncertain, with small-mindedness engendered by funding strictures on both sides of the Atlantic, one of the weaknesses of planetary science is its multidisciplinary nature. For better or worse this book fits in with the spirit of its subject. It is broad, demanding and calls on knowledge of all branches of the planetary and geosciences.

The book is very well produced (with aid from NASA) and is reasonably priced. The authors, 78 in number, have been chosen well. Stone and Owen introduce matters with a helpful overview whose structure mirrors the rest of the book, the topics breaking down as follows: the planet itself (interior, atmospheric composition, structure and dynamics, clouds, upper atmosphere, ionosphere); its magnetosphere (magnetic field, energetic charged particles, plasma and plasma waves, radio waves); and the rings and satellites (with Titan singled out for special attention). The introduction is then followed by a brief, instructive history (by Van Helden) of Saturn as examined through the telescope. This account should be required reading for any astronomer, if only for the light thrown on the relationship between theory and experiment in a subject where observational facts are sparse.

We can now say, however, that observational facts on the Saturnian system are no longer sparse, and the remainder of the book (900 pages) contains the technical details. Some of the material is very familiar to me, some of it far from my area of expertise. Yet although presentation varies from paper to paper, none of the contributions is inaccessible; to me this indicates the book is set to be a major source for years to come.

It seems futile to attempt to select highlights in the collection. To do so misses the point; the book's strength is its breadth of coverage. Buy it for that. Much of the material should be useful even at undergraduate level, and planetary scientists will not want to be without it — would that all astronomers and geophysicists thought they should not be without it. □

D.J. Southwood is a Reader in the Department of Physics at Imperial College, University of London.

In the beginning

John Fox

Rule-Based Expert Systems: The MYCIN Experiments of the Stanford Heuristic Programming Project.
Edited by Bruce G. Buchanan and Edward H. Shortliffe.
Addison-Wesley: 1984. Pp. 748. $39.95, £39.

EDWARD Feigenbaum of the Heuristic Programming Project at Stanford University, and author of a controversial book about the "Fifth Generation" in computing, believes that artificial intelligence is not just another computer revolution but *the big one*. The stimulus for such a confident claim was the announcement by Japan, in 1981, of its plans to build a new generation of computers based on the hardware and software technology of AI. This book is about one of the crucial developments in AI software, some would say *the* crucial development, the advent of expert systems.

Expert systems are programs which have enough expertise in specialist fields that they can solve problems at a level comparable to that of a human expert. Opinions vary as to which program was the first true expert system, but I am inclined to agree with Allen Newell, the eminent pioneer of AI who writes a foreword to the book, that "MYCIN is the original expert system that made it evident to all the rest of the world that a new niche had opened up".

The function of MYCIN was to advise doctors on the nature of bacterial infections and the use of antibiotics. Many of the features that it introduced are now seen as pivotal to the concept of expert systems, notably the emphasis on facts and rules of good judgement (rather than formal, quantitative methods) and the ability to explain the advice given. Another pattern for the future was the later development of EMYCIN, or Essential MYCIN, a package stripped of its specialist medical knowledge to give a general purpose "shell" which can be (and has been) used to build expert systems for other applications.

MYCIN was more than just another clever computer program; it was the beginning of a technology and is at the heart of whatever credibility AI and the "Fifth Generation" currently have. The program started out as Edward Shortliffe's PhD research but at various times involved a total of 30 people on as many projects. It deserves a careful appraisal. Buchanan and Shortliffe's volume looks back over the decade of the project's existence to try to provide both a historical record and a properly digested assessment.

The book is a collection of 36 papers covering numerous facets of the development of MYCIN. History and design of the original system are described, and then a series of sections deals with subsidiary themes, many of which have come to be core areas for the development of expert systems generally. Techniques for representing knowledge of different types and for different tasks are described, along with issues about building and checking knowledge bases. The use of the knowledge base for explanation and for teaching, as well as for advice, is extensively discussed. The problems of managing uncertainty, and of generalizing MYCIN's inference and knowledge representation techniques to cover other domains are analysed. A particular strength of the book is the emphasis on transferring the technology out of the research laboratory, reflected in sections on performance evaluation and on acceptability.

Many papers in the collection have appeared elsewhere, but the range of publications is wide, and the period long, so this anthology is fully justified. Furthermore, much of the material has been specially prepared, and many of the original manuscripts revised and brought up to date. The chance to analyse an influential development carefully and self-critically is infrequently offered in technology; here it has been taken.

What is the significance of the MYCIN project? In fact MYCIN is not in routine use, though it inspired systems which are. If software could be put in a museum, MYCIN would hold the same position as *The Rocket* in the National Railway Museum. The project is also an important example of how high technology research should be done — with flair and ingenuity, but with an eye on detail and systematic investigation, and on the way that the technology will be used. Newell thinks the MYCIN project also exemplifies the science of AI, by which he means the empirical exploration of intelligent systems. I am not so sure; I think that MYCIN has told us little that we did not know about intelligence and its principles. What MYCIN *has* shown us is how to put something that resembles rudimentary, but useful, intelligence into a machine, and that is more than enough. □

John Fox is Head of the Biomedical Computing Unit at the Imperial Cancer Research Fund Laboratories, London.