Distant goal

Philip Davenport

Fusion: The Search for Endless Energy. By Robin Herman. *Cambridge University Press: 1991. Pp. 267. £13.95, $19.95.*

ARISTOTLE specified three essentials for a narrative: a beginning, a middle and an end. These criteria pose problems of balance for an author seeking to tell the story of the quest to exploit thermonuclear reactions as a terrestrial energy source. The beginnings are obscured by a lack of documentation due to the secrecy imposed by governments of the day. By contrast, the period since international agreement on the declassification of fusion research in 1958 has seen a spate of papers, reports, periodicals and comment that must seem indigestible to the lay observer. Finally, it is not yet a success story; an economic fusion reactor is still a distant prospect. Indeed, over the years forecasts of its arrival have tended to recede into the future and are now nudging towards the middle of the twenty-first century.

Robin Herman, a science writer and former reporter, has overcome these difficulties with some panache. By introducing her story with a racy prologue describing a visit to the Joint European Torus (JET) at Culham, England in 1984, she avoids the pitfalls of a strictly chronological format. This sets the scene for a readable and at times exciting account of fusion research from the point of view of a nonspecialist and aimed at the general reader.

Herman's book will inevitably be compared with an earlier one covering similar ground, *Fusion: Science, Politics, and the Invention of a New Energy Source*, by Joan Bromberg (MIT Press, 1982). This is an official history of the US magnetic fusion project and was sponsored by the Department of Energy; it purports to be aimed mainly at those concerned with energy strategies and options. As its title suggests, it comprises a detailed account of the politics and power struggles between officialdom in Washington and fusion laboratories under its control.

In contrast, Herman's book is an entirely private venture stemming from local curiosity; the author lives at Princeton, New Jersey, and became interested in the activities of the Plasma Physics Laboratory there. Receiving a warm welcome, she was encouraged to embark on a national and later global tour of fusion laboratories and to attend the regular international conferences that are a feature of fusion research. The result is a penetrating survey of worldwide progress towards the goal of economic fusion power, engagingly told using verbatim transcriptions of interviews with many of the scientists and engineers that are prominent in the field.

Over the years, fusion research has suffered from sporadic bouts of sensational reporting in the media, with promises of "limitless power from the oceans" with the aid of "man-made Suns". An early example was the announcement by the Argentine dictator Peron on March 1951, who claimed that a thermonuclear reactor had been developed there by Ronald Richter, an Austrian immigrant. This news was received with informed scepticism by nuclear physicists in both Britain and the United States, a view fully justified by the subsequent events. But the story has been put about, first by Bromberg in her book and now echoed by Herman, that Richter's claim was directly responsible for the inception of the US fusion programme.

Although it may be true that Richter's 1951 claim inspired Lyman Spitzer Jr at Princeton to invent and build his 'Stellarator', the groundwork of fusion research in California which blossomed into the Sherwood project certainly predates it. Serious fusion-oriented work on toroidal gas discharges, led by Peter Thonemann, had begun at the Clarendon Laboratory, Oxford in 1947. James Tuck who went from the Clarendon to the United States in 1949, was fully conversant with this research. He started fusion work at Los Alamos, and indeed the name Sherwood is a reference to his legendary namesake Friar Tuck, who dwelt with Robin Hood in Sherwood Forest. Edward Teller himself visited the Clarendon in 1949. He was shown the work and had animated discussions with Thonemann and his colleagues. Thus there was awareness in the United States of British activity in controlled thermonuclear research some years before the Richter fiasco.

Another example of a fusion 'breakthrough' that was given hysterical publicity by the world media was the cold fusion claim of Martin Fleischmann and Stanley Pons in 1989. Here again, Herman exaggerates its impact on the fusion community. In essence, cold fusion postulated that the metal palladium had magical properties and catalysed the fusion of deuterium, despite the fact that hot palladium has been used routinely since the 1940s for admitting deuterium gas into fusion apparatus without any such effect being detected. One is left wondering why a firm rebuttal of these claims was so long in coming. Perhaps it was delayed by fear of litigation. Lawyers have already bedevilled medical science in the United States; let us hope that physical science will not suffer the same fate.

In many countries, government funding of science is apt to be fickle. In times of stringency it is subject to cuts, and long-term ventures such as fusion are particularly at risk. Herman believes that the example of JET points the way towards continuity of funding. The existing global collaboration between interested nations should be extended, with enduring commitment, towards full international integration. This somewhat utopian idea could make possible the construction of the huge fusion experiment which many experts believe to be the next logical step. The fusion fraternity should read this book and take heart for the future. □

Philip Davenport is at 3 French Mill Rise, Shaftesbury, Dorset SP7 8HS, UK.

Plumbing the depths

A. J. Southward

Deep-Sea Biology: A Natural History of Organisms at the Deep-Sea Floor. By J. D. Gage and P. A. Tyler. *Cambridge University Press: 1991. Pp. 504. £80, $135.*

THE bottom of the ocean has been a lure and challenge to scientists for at least 150 years, but is the most difficult part of the biosphere to study. Few of the world's oceanographic vessels are fully fitted to keep station precisely over the sea bed or to handle the large volumes of fine sediments brought up. It says much for Gage and Tyler's perseverance that they have sustained studies of the deep-sea fauna for nearly 20 years, enough to show long-term as well as seasonal interannual variations in the deep-sea fauna and its food supply. They are now giving us a distillation of their own active involvement, set in the context of the past 20 years' worldwide advance in knowledge of the deep sea.

The first section of their book proceeds from a historical summary to a review of the physical environment. Methods of investigation are then described in some detail as far as sampling gear is concerned, particularly infaunal quantitative samplers, epifaunal trawls and remote photographic equipment. Submersibles and remote vehicles are given less attention.

The second section reviews the great diversity of deep-sea life, now known to be far removed from the "abyss. . . where life is either extinguished, or exhibits but a few sparks to mark its lingering presence" (E. Forbes and R. Godwin-Austen, *The Natural History of the European Seas*, John Van Voorst, London, 1859). There are the megafauna of often strange aspect: the glass-