"renewable" sources. With the exception of some introductory history and a rather conventional chapter on conservation, we are told little about the present structure or plausible elasticity of energy demand. And even the treatment of supply is irritatingly incomplete, in that we learn how much primary energy sources might notionally produce, but rarely how much they do in fact provide or could credibly supply at some specific future date.

Anyone recommending the book to students will want to balance it with some antidote for those ailments. But that is a slight matter in relation to its principal weakness: the absence of any basis on which a reader can compare the supply and policy alternatives discussed. In choosing between, say, different electricity fuels, a normal approach would be to set out their respective costs, including as necessary any "social" or "intergenerational" costs. No one reading Diana Schumacher's work will be prompted in that direction, simply because both broad and narrow questions of economic cost and benefit receive hardly more than an occasional — and commonly dismissive — allusion.

There is good evidence for the omission being a considered one. For example, "the energy future . . . transcends the realm of economics alone. . . decisions about it should be the democratic product of the public will" (p.293). Fair enough. In practice, however, Ms Schumacher imports other measures not to supplement economic analysis but to supplant it. Sadly, the effect is to undermine not only the value of her frequently informative book but also her occasionally moving case for changing the content of energy policy and the way it is made. Achieving beneficial change democratically depends on first equipping energy producers and consumers to judge what changes will, in fact, benefit them and their social and physical environments — which is *par excellence* a task for economically as well as socially sensitive educators. By leaving choices to be made only between what is old but familiar and what is new but uncertain, without offering any common measuring rod, Diana Schumacher resigns the energy future to "the devils we know". □

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Second editions

● *Rice Diseases* by S.H. Ou, published by Commonwealth Agricultural Bureaux, Farnham House, Farnham Royal, Slough SL2 3BN, UK. Price is £38 in CAB member countries, \$70 elsewhere.

● *Modern Practice of Gas Chromatography* edited by Robert L. Grob. Publisher is Wiley, price is £75.20, \$86.45.

● *Radiotelesopes* by W.N. Christiansen and J.A. Högbom, published by Cambridge University Press. Price is £30, \$59.50.

Understanding from Africa

W.T. Dean

Lower Palaeozoic of North-Western and West-Central Africa. Lower Palaeozoic Rocks of the World, Vol. 4. Edited by C. H. Holland. Wiley: 1985. Pp.512. £69, \$130.

PLINY the Elder's oft-quoted comment on Africa as a perpetual source of novelties assumed an especial significance for geologists everywhere during the 1950s and 1960s. Particularly exciting was the discovery, and the description by P. Hupé, of abundant, well-preserved Lower Cambrian fossils in the Anti-Atlas area of Morocco. Their importance lay in the fact that although the estimated age of the Earth in absolute terms is some 4,600 million years, it was only at a point about 570–590 million years ago (estimates vary) that the remains of animals with hard parts capable of being fossilized appear on a world-wide scale in the geological record.

In relative time, this point marks the end of the Precambrian and the beginning of the Phanerozoic, and in terms of rock successions coincides with the base of the Cambrian system, named for Wales. Unfortunately, in its eponymous country the Cambrian has not provided a readily definable base, but attempts to define this boundary have produced a remarkable amount of international collaboration and discussion, though no decision as yet. This digression will, I hope, serve to emphasize the importance of the Moroccan Lower Cambrian sections, though earlier hopes of them have not yet been fully realized.

It is clear from the preface of this volume that parts of the manuscript were delayed, and an unfortunate result is that some important, newer results are omitted. Among them are those of F. Debrenne from her work on the archaeocyathids, and in particular K. Szalay's preliminary report on trilobites still older than those described by Hupé. I may seem to be lingering unduly over Morocco, a country almost twice the size of Britain, at the expense of Algeria which is five times larger again. Nevertheless it is in Morocco, particularly the Anti-Atlas which provided the standard Lower Palaeozoic succession for the country, that documentation is most detailed.

It is inevitable that a book containing accounts of individual countries by different authors will lack coherence, but the contributions do have certain stratigraphic themes in common and a unifying summary or review would have made the volume more generally useful. One of the benefits of plate tectonic theory is that it has rendered respectable the sort of palaeogeographic reconstructions, includ-

ing those for the Lower Palaeozoic, that would have been unacceptable 30 years ago. At a time when Africa formed part of an even larger continental mass, marine platform sedimentation took place on a scale unparalleled in modern times and relatively modest sea-level changes had far-reaching consequences in terms of vast marine transgressions and regressions. The striking absence from Africa of Upper Cambrian rocks is part of a wider phenomenon involving regression, not always complete, in the Middle East and parts of Europe, and some discussion of it would have provided additional interest.

For many geologists the demonstration in 1963 that a large glacial complex some 440 million years old, centred on the late Ordovician South Pole, lay in what is now the desert areas of southern Morocco, proved at least as exciting as the new data for the Lower Cambrian. It would have been helpful for general readers to be told something of the accompanying regression, whose effects are claimed to have influenced both sedimentation and faunas as far afield as southern Scandinavia and parts of present-day North America, then much closer to Africa. Marine transgression on a grand scale followed the end of the glaciation, though the age of the resulting basal deposits may vary slightly with location. Again, the regional story involves not only Africa but also parts of the Middle East and Europe, and there are highly relevant researches, such as those of J. K. Leggett on associated deposition of black shales, that one would have liked to see mentioned.

These points seem minor when set against the overall benefits of this first general review, in English, of a region of daunting size and often difficult terrain. Many readers may not appreciate that even in Britain, which has one of the world's oldest national geological surveys, systematic geological mapping of all parts of the country has still not been undertaken. But the size of Morocco and Algeria is far exceeded by that of west and west-central Africa, a region less well known and the subject of an admirable review that contains much previously unpublished information, including that from oil exploration.

The book's contents are in large measure a tribute to the efforts over many years of numerous French and, in west-central Africa, Belgian geologists, whose work is evident in the full reference lists. The volume is dedicated, appropriately, to the late Henri Holland, doyen of workers in Morocco. It is particularly sad to read on the book's dust-cover that this is the fourth and last of a series that was still far from completion and for which there remains a widespread need. □

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