book whose promise is not fully realized. It is to be hoped that the genuine need to which he has addressed himself will lead to further research that goes beyond the limitations of this treatment.

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Historical Oceanography

Oceanic Micropalaeontology. A. T. S. RAMSAY, Ed. In two volumes. Academic Press, New York, 1977. Vol. 1, xii pp. + pp. 1–808, illus. + index. $87. Vol. 2, xxi pp. + pp. 809–1454, illus. + plates and index. $70.25.

The paleontology of microscopic organisms of the open ocean constitutes the most valuable part of the memory of the deep sea. Probing of this memory—by piston coring since the Swedish Deep Sea Expedition of 1947–1948, and since 1968 by deep-sea drilling from the *Glomar Challenger*—is rapidly changing our understanding of the role of the ocean in the evolution of climate and life on earth.

The cyclicity of the Quaternary climate, first demonstrated in the '50's, has now been definitely linked to the "Milankovitch" mechanism. The temperature fields and the circulation of glacial seas have been mapped as a first step for climatic modeling. The history of Cenozoic oceans is gradually emerging from paleontologic and isotopic studies and from preservational analysis. Mesozoic oceans are next, promising a glimpse of an entirely different system, with sluggish circulation and low oxygen content of deep waters. The stratigraphy of pelagic microfossils, established in the '50's and since refined, is the crucial tool for interpreting the drilling results: it was the stratigraphers who provided the time scale for those clever plots showing that distance to ridge crest increases with age, that sedimentation rates change through time, and that the record contains many gaps—as yet unexplained.

The structure of the book at hand suggests that the editor had in mind a treatise providing a comprehensive account of the state of the art both in paleoceanography and in the biostratigraphy of plankton remains. The book contains contributions of several kinds.

A handbook aspect is realized in a number of papers on the taxonomy and stratigraphic use of pelagic microfossils (foraminifera, radiolarians, coccoliths, dinoflagellate cysts, silicoflagellates). In the main, these papers are written by leaders in their fields (W. A. Berggren, W. R. Riedel and A. Sanfilippo, E. A. Pessagno, W. W. Hay, G. L. Williams, E. Martini). The stratigraphically oriented papers constitute just over 60 percent of the work (930 pages), with an immodest 430 pages for a catalog of Mesozoic foraminifera (from marine sediments on land) by B. Masters. The treatment of Cenozoic foraminifera falls short: instead of a review, a report of a leg of the Deep Sea Drilling Project was included.

A number of the papers (including some of the stratigraphic ones) are reviews of broad interest. A. W. H. Bé gives a thorough summary of the ecology, zoogeography, and taxonomy of living planktonic foraminifera and (with R. W. Gilmer) provides a similar overview for pteropods. R. E. Casey summarizes radiolarian ecology, J. van Donk surveys the use of oxygen isotopes, and A. T. S. Ramsay, the editor of the book, closes with a chapter on Tertiary paleoceanography. These reviews (about 400 pages) add up to a little over one-fourth of the book.

The remaining papers (about 200 pages) give a sampling of current research in the field. One focuses on the Quaternary oceanography of the North Atlantic (W. F. Ruddiman), three address the question of distribution of Recent coccoliths (S. Honjo, K. R. Geitzenauer *et al.*, N. Schneidermann), and one treats computerized biostratigraphy (T. R. Worsley and M. L. Jorgens). Not surprisingly, the excitement of the youngest offspring of biostratigraphy—paleoceanography—comes through in the papers in this last category. In the contribution by Ruddiman, for example, the special character of the North Atlantic as a climatic amplifier system is beautifully displayed in the deglacial retreat of polar waters, from a position at the Iberian peninsula back toward Greenland.

Ramsay's contribution to the work summarizes an immense quantity of raw data from the Deep Sea Drilling Project volumes, emphasizing fluctuations of the CCD (calcite compensation depth) and hiatus fluctuations. The CCD fluctuations are becoming ever more enigmatic. The simple idea of basin-shelf fractionation (with carbonate accumulating on shelves during transgression and therefore not available for the deep sea, and vice versa) is attractive. However, it has received a severe blow from the recent compilation of global oceanic sedimentation rates showing low values during the Oligocene, which is a time of regression and of a deepened CCD. It appears, therefore, that to explain CCD fluctuations we must look not only to mass balance but to the shape of saturation profiles and to bottom water flow. Ultimately, the fertility of the ocean and the intensity of deep circulation are probably the best candidates for agents of CCD variation.

The study of hiatus distribution through time is an entirely new departure in deep-sea stratigraphy and is of great conceptual importance. Ramsay's efforts in this direction are to be highly commended. T. C. Moore and co-workers, who presented results on hiatus stratigraphy in 1974 at the Conference on Marine Plankton and Sediment in Kiel, have made considerable progress in this field.

While Ramsay's contribution is impressive in scope and originality, he could have done better as an editor. Besides the—perhaps—unavoidable typesetting errors, there are some serious difficulties. For example, figure 7 and table 1 of the chapter on Recent radiolarians are incomprehensible—it is not clear where the information comes from. The illustrations in the chapter on Paleogene foraminifera are substandard; some have to be looked at with a hand lens. This is carrying the "micro" thing too far. These (and other) problems, such as the lack of information on diatoms and benthic foraminifera, tend to detract from the basically appealing makeup of the work.

There is no question that micropaleontologists and historical oceanographers will want to have access to this book and that professors will want to assign certain chapters to their graduate students. I have been giving Bé's chapter to my students for the last four years, in preprint form. It is still essentially up to date. Time has not been as kind to some of the other papers.

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Magnetochemistry

Magnetic Properties of Transition Metal Compounds. RICHARD L. CARLIN and A. J. VAN DUYNEVELDT. Springer-Verlag, New York, 1977. xvi, 264 pp., illus. $18.80. Inorganic Chemistry Concepts, vol. 2.

Frequently, magnetic properties of transition metal compounds are measured by chemists who are seeking information about the substances they encounter in the investigation of fundamental chemical problems. Often, simple measurements made with the most rudimentary equipment provide all the information necessary to answer the questions at hand, and meaningful research programs continue advantageously with such results.