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.

Another group of scientists, largely physicists, measure magnetic properties of transition metal compounds because they are interested in the physical processes that are involved and in the identification of real systems that exhibit properties predicted by various theoretical models. Using information gained from careful and precise studies, theories of magnetic systems are refined, and the powers and limitations of the theories are identified and understood. Often, directions for new investigations become apparent from the analysis of the compatibility of theory and experiment.

Somewhere in the middle, there are a large number of scientists—mostly inorganic chemists with some physical chemists—who are fascinated by the magnetic properties themselves and who want to find out how changes in chemical functionality and structural details affect the properties. The present book is apparently intended for this group. The authors have been stimulated by the excellent review article on magnetic ordering phenomena by L. J. de Jongh and A. R. Miedema (*Adv. Phys.* **23**, 1 [1974]) and have borrowed liberally from it, often adding information about elementary, basic developments that is judged to be necessary for chemists. In directing attention to this review, the authors aim "to point the way that . . . the science of magnetochemistry should be going"; they state that "it is no longer tenable to write only about such subjects as distinguishing stereochemistry from the measurement of a magnetic susceptibility [sic] over a restricted temperature region; that is, paramagnetism is so well-understood that little remains to explore which is of fundamental interest." This statement is difficult to reconcile with their statement early in the first chapter that "paramagnets are the subject of this book." In fact, paramagnetism is dealt with at length only in parts of four chapters; the other four chapters are devoted to dimers and clusters, long-range order, short-range order, spin-flop processes, metamagnetism, ferrimagnetism, and canting. Except for the chapter on dimers and clusters, which is too brief to be very useful but whose subject has been treated in detail in a number of other places, these chapters will serve a good purpose as a guide to the de Jongh and Miedema review. Considerable attention is also paid to selected examples; much of the material in these chapters is drawn from the authors' own research. It should be noted that very recent reports have called in question some aspects of this work.

There are a few slips that will be troublesome for the uninitiated. For example, the term 1/3 S(S + 1) in the Hamiltonian of equation 3.2 is omitted when the data are plotted, incorrect magnetic ordering is ascribed to at least two systems, operators are mistaken for quantum numbers, and the section on temperature-independent paramagnetism is abbreviated in such a manner that it is impossible to accept as written. Considerable effort is expended in developing a crystal field theory, and then the effort is dismissed in the discussion of the properties of titanium(III) with the statement that such calculations "are useful pedagogical devices but bear little relationship to the true nature of the problem." One might have expected the gauntlet, once thrown down, to have been picked up and this important problem to have been set straight. Such is not the case, and the reader is left to learn the details of the quasi-quartet state that arises in $Ti(III):CsAl(SO_4)_2 \cdot 12H_2O$ by himself or herself. For me, that meant a trip to the library and some reasonably extensive work; if other readers of this book are stimulated in this manner, then I think the authors' goal will have been achieved.

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Immunohematology

Human Blood Groups. Proceedings of a meeting, Buffalo, N.Y., June 1976. J. F. MOHN, R. W. PLUNKETT, R. K. CUNNINGHAM, and R. M. LAMBERT, Eds. Karger, Basel, 1977. xii, 462 pp., illus. $46.75.

Human blood group research, like other fields of science that have undergone phenomenal expansion, has changed direction and leadership. The field burgeoned in the 1940's, held its ground in the 1950's, and has been characterized by changing perspectives ever since. Current interests are clearly visible in this collection of 46 papers, which, although entitled *Human Blood Groups*, differs radically in subject emphasis from the standard Race and Sanger book *Blood Groups in Man*. This is neither good nor bad; it only reflects what has happened to the field. Today working blood banks struggle with their daily tasks to such a degree that they can no longer be oriented toward basic science, and the disciplines of human gentics, physical anthropology, and forensics no longer depend heavily on red cell blood types for a data base. A reader will search this book in vain for specific discussion of problems related to transfusion medicine and erythroblastosis. The collection is largely concerned with basic science.

Where is the scientific action in human blood group studies? The most concerted activity has been directed toward elucidation of the structures of glycosphingolipid erythrocytic antigens, and this collection contains good short reports on the subject from D. M. Marcus *et al.*, J. Kościelak, D. A. Zopf *et al.*, and S. Hakomori *et al.* The major erythrocytic glycoprotein has been much more difficult to analyze; the status of efforts to do so, as of 1976, is described by V. T. Marchesi *et al.* Novel antigenic features are discussed by Elwira Lisowska and Maria Kordowicz, who identified specific M and N gene-determined xenoantigens in both desialized and Smith-degraded peptides. None of the other red cell antigens has been chemically defined as yet. D. J. Lorusso *et al.* give an account of their somewhat meager progress in attempting to isolate the Rh antigen. Although the Duffy antigen has not been isolated either, its remarkable relation to erythrocytic malaria receptors, discussed by L. H. Miller *et al.*, is an excellent illustration of the influence of environmental pressure (malaria) on the incidence of a blood group phenotype (Duffy-null is common in Africa).

Old-time blood group serology has not disappeared, and this collection contains some typical reports. But it also contains a chapter by A. E. Szulman on the immunofluorescent localization of A, B, and H in tissues and one by M. Fellous *et al.* on their excellent cell hybridization studies showing that P1, P2, and P^k are not allelic products, a conclusion in confirmation of the earlier views of Marcus, who identified the structures of the different glycosphingolipids that carry these antigens. The volume, however, pays inadequate attention to erythrocytic membranes and the role of mechanoproteins in preserving erythrocytic structure and antigenicity. And, although S. Seidl *et al.* report on the erythrocytic defects associated with Rh_{null} and Rh_{mod}, there is no mention of the acanthocytic changes associated with the McLeod phenotype in the Kell system and the relationship of this to sex-linked chronic granulomatous disease.

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