As with previous Ciba Foundation symposia, the publication of discussions following each paper as well as several general discussions adds a delightful style to the book and gives the reader insight into the thinking of the participants. The fact that the chairman (F. H. C. Crick) is not a pharmacologist broadened the discussions in an interesting manner.

The coverage of pharmacologic receptor systems is not broad and, except for one paper on the adenyl cyclase system (S. E. Mayer), only acetylcholine receptors are covered (S. Thesleff and P. G. Waser).

The section discussing methods used to study protein structure and configurational changes is quite good. An elegant paper by Beddell, Monet, and Phillips on crystallographic studies of lysozyme points out the dangers of drawing conclusions about substrate-enzyme binding without data on the structure of the complex. Indeed, it is somewhat unsettling to the reviewer that seeming small changes in the structure of the substrate may lead to very different binding to the active site. One's ideas about specificity of the active site may be changed after reading this paper. Application of nuclear magnetic resonance spectroscopy is discussed by Jardetzky, fluorescent spectroscopy by Stryer, and affinity labeling by Singer. The nonexpert will gain insight about the value of these techniques, since they are presented by experts at a conceptual level as well as an experimental level.

Finally, ideas of how pharmacologic receptors "work" are discussed under the heading of conformational change. Wyman reviews subunit interaction in hemoglobin, and Changeux, Blumenthal, Kasai, and Podleski present a scheme for conformational changes during membrane excitation, based largely on data from eel electroplax experiments.

At the end of the symposium the participants discussed the present and the future. It was obvious to all that only the surface has been scratched in this field but progress is being made. All pharmacologists and others who think about drug receptors would be well advised to read this interesting volume.

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Biogenous Deposits

The Micropalaeontology of Oceans. Proceedings of a symposium, Cambridge, England, Sept. 1967. B. M. FUNNELL and W. R. RIEDEL, Eds. Cambridge University Press, New York, 1971. x, 828 pp., illus. $55.

The most common deposit on the surface of our planet is biogenous pelagic ooze. Biopelagites are derived principally from coccolithophorids, foraminiferans, radiolarians, diatoms, and to a lesser extent pteropods. Minor and occasional constituents are benthonic foraminiferans, silicoflagellates, dinoflagellates, and ostrocods, as well as pollen and spores. The distribution of the various organic remains is governed by biologic, ecologic, and sedimentologic processes determining production, transfer, dissolution, and redeposition. These processes vary from area to area and through geologic time. Thus there are many variables entering into the patterns of biopelagic sedimentation, and the deep sea record is difficult to interpret in terms of the history of the oceans.

As a fitting preparation for the tremendous task of reading the oceanic history from the record recovered by the Deep Sea Drilling project, a working group of the Scientific Committee on Oceanic Research (SCOR), chaired by E. Seibold, organized an international symposium four years ago in Cambridge, England. The present volume is the somewhat belated product of this meeting. The book contains 52 papers by 45 authors (mainly from the United States, the Soviet Union, and Great Britain). The papers are organized into six sections: on zoogeography, on sedimentation and facies patterns, on Quarternary sequences, on pre-Quaternary distribution, on methods and systematics, and on stratigraphy.

The first author in each section sets the stage with an important review paper. J. A. McGowan looks at species patterns of the Pacific, what they are, how they are maintained, and how they developed. In discussing pattern development he severely criticizes several papers interpreting the Pleistocene foraminiferal record. This interest on the part of an ecologist is most heartening, for it is ecological information that is most sorely needed to make these interpretations.

A. P. Lisitzin contributes a wealth of quantitative information on siliceous and calcareous microfossils in suspension and on the ocean floor. Lisitzin emphasizes the great loss of silica occurring before sedimentation is achieved: compared with the 80 to 160 $\times 10^9$ tons a year produced, only 0.3 $\times 10^9$ tons can be sedimented if output equals river input for a sedimentation efficiency of 0.2 to 0.5 percent (not 2 to 5 percent as stated). Most of this destruction takes place in the upper waters. The predominant role of the Antarctic belt of silica accumulation with rates of up to 1 g/cm^2 per thousand years is strikingly illustrated. The creation of this sink through establishment of the circumpolar current (separation of Australia, opening of Drake Passage) should play a major role in the interpretation of ancient silica deposits. Lisitzin shows that, like silica supply, carbonate supply is controlled by fertility, whereas preservation patterns are controlled largely by increasing solution with depth. His explanation of the familiar but paradoxical carbonate increase with depth to about 2000 meters in the Atlantic, as decreasing dilution by terrigenous and siliceous materials, ignores intense dissolution in the shallow hemipelagic sediment off continents, where supply of organic matter leads to development of interstitial CO_2. A similar effect prevents the simple horizontal extrapolation of the level "at which carbonate solution in bottom sediments begins" across the fertile equatorial region (figure 11.9). This level varies in depth between and within oceans. Lisitzin's main point, however, that solution increase level and critical (or compensation) depth are strictly separate phenomena is clearly brought out and certainly bears repeating in view of the widespread confusion on the matter. His north-south profiles of the critical depth (10 percent $CaCO_3$) are especially useful. The user of the numbers given in Lisitzin's tables should note carefully the methods by which they were obtained, if necessary by consulting the original reference.

E. Olausson approaches the carbonate system by stressing the role of deep circulation patterns, as well as the supply of organic matter to the ocean floor in producing sedimentation patterns. His attempts at reconstruction of the Pleistocene ocean environment are most instructive, even though the reader may be baffled at times by the barrage of facts with which Olausson supports his arguments.

The compilation of pre-Quaternary

microfossil occurrences by B. M. Funnell reminds us that this important source of information should not be overlooked in the euphoria over the later drilling results. Funnell realized early the implication of these occurrences for testing the sea floor spreading hypothesis, and his brief discussion on the subject is up to date for the time (1967).

A. Longinelli summarizes the major difficulties in interpreting $^{18}O/^{16}O$ fluctuations in Pleistocene faunal assemblages. We do not know how the isotopic composition of sea water changed through time, and we are largely ignorant of the ecology of shell formation. Some information has become available since 1967, however. One promising approach is to calculate the most probable temperature of formation for the total assemblage of surface water species in well-preserved sediments on the basis of the present-day temperature range of each species. This allows the isotope curve to be standardized against temperature, so that the effect of varying composition can be accounted for.

M. N. Bramlette (who pioneered the stratigraphic use of coccolithophorids) and W. R. Riedel (who did the same for radiolarians) introduce the section on biostratigraphy by listing concepts and rules in this field of research and illustrating the special conditions obtaining in deep sea deposition that may foil the unwary.

Other comprehensive presentations of wide interest in this volume include Bé and Tolderlund's foraminiferal temperature range and distribution charts (the zone chart has a drafting error, showing a transition zone fauna in the Baltic Sea, which actually contains no planktonic Foraminifera), Riedel's maps and documentation of the distribution of pre-Quaternary radiolarians, and the very useful papers on Quaternary and Tertiary stratigraphy by Hays and Berggren and by Berggren.

The discussion of the Miocene-Pleistocene boundary by Hays and Berggren shows that this part of stratigraphy is unnecessarily burdened by problems of a historical-nomenclatural type in addition to difficulties deriving from the real world of evolution and climatic change. With improved understanding, certain local (and quite possibly incomplete) type sections will take their proper, subordinate place. The need for ever sharper "definitions" of a Pliocene-Pleistocene "boundary" will then diminish. Sharp boundaries between epochs, after all, are figments of the mind, not facts. Berggren's Cenozoic time scale (at the end of the book) has undergone several revisions in response to new information. The latest edition will be found in a forthcoming issue of the *Journal of Foraminiferal Research.*

In addition to the more comprehensive papers mentioned, there are numerous shorter contributions with useful information on planktonic and benthonic microfossils. In addition, there are a (surprisingly small) number of papers that would normally be rejected by a journal, in their present form.

This fine volume will become an important reference for all students of deep sea sediments.

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Chromosomes and Other Topics

Advances in Cell and Molecular Biology. Vol. 1. E. J. DUPRAW, Ed. Academic Press, New York, 1971. xvi, 308 pp., illus. $15.

Probably any short modern compilation concerned with a subject as broad as cell and molecular biology must cover diverse topics and only a small portion of the total. If there is a feature common to most of the reports in this one, it is the use of ultrastructural observation. The volume is also characterized by scholarly reviews that will be of interest to most cellular biologists.

Elgin, Froehner, Smart, and Bonner, in their paper on chromosomal proteins, draw particular attention to the extraordinary evolutionary conservation of histone IV (comparable to that of the sugar-phosphate backbone of DNA) and to the existence of only a small number of unique histone molecules. Although histones must contribute to genetic repression, other components of chromatin (possibly other proteins in concert with RNA) must provide the requisite specificity. Conceivable roles of acetylation, methylation, and phosphorylation are unclear. Hormonal response may imply gene derepression by prevention of histone binding during replication. Nonhistone chromosomal proteins seem to serve not to repress template activity but to interact with histones so as to mitigate repression. From vast accumulated information the authors suggest promising approaches to the problem of gene repression and activation.

After keen analysis of a large body of old and new information on chromosome breakage and rejoining, Kihlman suggests, as a hypothesis to stimulate discussion, that dark repair, genetic recombination, and chromosome aberration all involve the same biochemical mechanisms. His response to the inevitable consideration of chromatid structure is to support the single folded fiber model. However correct his judgment may ultimately prove to be, it is unfortunate that he has neglected alternative explanations for supporting evidence. He accepts visual evidence for lack of doubleness of chromatid structure as conclusive although postreplicative chromosomes are known frequently to appear single, and he ignores visual evidence for doubleness of chromatid structure.

"The molecular architecture of synaptonemal complexes" by Wettstein and Sotelo should be read thoroughly. Some initial ambiguities of terminology are later clarified. If DNA is indeed present in the synaptonemal complex, available evidence suggests that it must be scarce. The authors, whose studies of the fine structure of the synaptonemal complex are among the best available, doubt that the structure bears a close resemblance to the lampbrush state. They suggest that synaptonemal-like complexes (not associated with orthodox pairing) may result from failure of synthetic repression. It is disappointing that these authors, like other students of the synaptonemal complex, have not considered the structural intricacies apparently necessitated by shortening of bivalents during pachytene.

McGee-Russell and Allen describe elegant ultrastructural studies on *Allogromia* which provide evidence for a highly labile class of microtubules to account for reticulopod extension. They significantly suggest that labile microtubules may be more generally distributed.

Lampert notes that chromosomes from malignant cells have a characteristically altered appearance at metaphase (spread poorly, stain lightly and unevenly). He found chromosome dry mass similar in malignant cells to that in normal cells but packing ratio altered. He suggests that the differences in packing ratio may be related to the state of gene regulation.

Bajer and J. Molè-Bajer describe