Beyond Vartapetian's fine introductory chapter, "Life without oxygen," there is no effort at unification or logical order in the arrangement of the contributions. The volume could also have benefited from better indexing and perhaps from a state-of-the-art summary. Nevertheless, this is a welcome collection of important papers, highly relevant to current land and plant use problems.

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## Chromatin Structure

**Chromatin**. Papers from a symposium, Cold Spring Harbor, N.Y., June 1977. Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., 1978. In two volumes. xxxviii, 1260 pp., illus. $80. Cold Spring Harbor Symposia on Quantitative Biology, vol. 42.

In 1973 a symposium on chromosome structure and function was held at Cold Spring Harbor. The subject was revisited in 1977, and the proceedings of this second conference are detailed in these two massive volumes. The differences in approach, techniques, and viewpoint are incredible and attest to the remarkable advances in this field in a period of only four years. What has happened is the sudden emergence and elaboration of the concept of nucleosomes as unitary building blocks of chromatin structure. The nucleosome comprises a defined length of DNA wrapped about a specific complex of eight histone molecules. Most of the chromatin in eukaryotic cells seems to be built up from such simple structures, and the recognition of this fact has provided a framework in which specific questions about higher levels of chromosome structure and chromatin function can now be phrased.

By 1973 the first glimmerings of this concept were emerging, but none of this made its way into the 1973 volume. In the 1977 volume, nearly half of the 119 papers are concerned with aspects of nucleosome structure, and many of the remainder draw heavily on the concept.

The two volumes are divided into groups of from three to 21 papers on common topics. Though the assignments seem arbitrary in a few instances, this arrangement helps organize for the reader what would otherwise be an unwieldy collection. The order of topics is logical and reflects nicely the current status of the field.

To critically review such an immense collection seems impossible to me. There are so many excellent papers, covering such a diversity of topics, that citations of the "best" would be little more than a list prejudiced by the reviewer's special interests. Therefore, I will simply describe the categories of topics covered and discuss how they relate to one another.

The first three sections (and parts of the fourth) are concerned with various aspects of nucleosome structure. A variety of techniques, ranging from x-ray diffraction and neutron scattering to studies of nuclease digestion and hydrodynamics and electron microscopy, have been brought to bear. The result is a fairly coherent picture of the nucleosome as a defined particle.

The topic of higher-order structures is taken up next, initially with concentration on higher-order coiling of fibers of nucleosomes and the putative roles of lysine-rich histones. The section continues with a number of papers on chromosome structure, with the evident aim of bridging the gap between local and overall structures in the chromosome.

A series of papers on "simple systems" is interleaved here. This section is rather a mixed bag; although it does contain papers on what might be considered "simple" systems (SV40, bacterial nucleoids, *Oxytricha* chromatin), it also includes papers that might well have been placed elsewhere in the volumes.

The emphasis then shifts to the problem of transcription. Here the first set of papers, on primary products, lays the groundwork, with emphasis on mechanisms and fidelity of transcription, primarily in the more well-defined systems (such as adenovirus, SV40, and the 5*S* genes in *Xenopus*). There follows a series of papers on regulated systems that deals with those systems in which transcription appears to be under extranuclear control of some kind. This portion of the proceedings closes with a long series of papers on transcriptionally active chromatin. Two general approaches can be discerned here—attempts to devise ways to test for or to separate "active" chromatin from the bulk and attempts to utilize the distinct morphology of some "active" regions (puffs and Balbani rings, for example) to examine the transcriptional process. The impetus for both approaches is the same; only a small fraction of the eukaryotic genome is normally transcribed, and the problem is one of selectively studying a small part of a complex system. To this reviewer it seems that the vital connection between chromatin fine structure (as exemplified by nucleosome organization) and control of transcription has yet to be made. Perhaps it will be the dominant theme in another four years or so.

The proceedings closes with four sections on gene organization, the first two of which emphasize the organization of eukaryotic structural genes as deduced from cloning experiments. The other two sections are devoted to histone genes and to repetitive sequences.

One gains from these volumes a sense of the excitement and rapid movement in the field. Indeed, progress is so rapid that the symposium can be looked at as an "interim report" that provides a complete picture of the status of the field in 1977. To anyone working in the field, these are valuable reference books. To the scientist planning to learn the literature, there is probably no better way to begin to do so than by reading these volumes. Anyone wanting an overview of the field might well be advised to begin by reading Chambon's summary of the symposium.

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## The Ocean-Atmosphere System

**The Chemistry of the Atmosphere and Oceans.** HEINRICH D. HOLLAND. Wiley-Interscience, New York, 1978. xvi, 352 pp., illus. $24.95.

Holland's book approaches its subject more from a geologic than from a chemical point of view. It presents a broad discussion of the material balances of geologic materials as they enter or leave the major earth surface reservoirs: the continents, the rivers, the oceans and their underlying sediments, and the atmosphere and its principal gases. Holland's geologic knowledge is considerable, and his perspective is that of one who likes to view the great forces that govern the whole earth over geologic time. For those of us who may often be preoccupied with microscale chemical mechanisms, geochemical changes on a regional scale, and time periods measured in days or years, it is good to be reminded of this larger view.

Though the book is relatively slim, its six chapters contain roughly 600 references to the earth science literature. A figure or diagram appears on practically every second page of text, a table on every fourth page. Consequently, the book offers a compilation of data on global geochemical relationships as well as a description of large-scale processes.