the gene-carrying substance DNA. Since then, the structures of many natural and synthetic polynucleotide chains, as well as paired nucleotide crystals, have been determined, and this work is conveniently summarized in Sobell's chapter on nucleic acid structure. This information is pertinent to special situations involving hydrogen bonding, as in the origin of the alternating dAT polymer formed by unprimed DNA polymerase, or codon-anticodon interaction and Crick's wobble hypothesis. Recent progress has been remarkable in the determination of the base sequences of the transfer RNA molecules and 5*S* ribosomal RNA This information has implications for the tertiary structure of these functional molecules, although much remains to be learned of the signficance of these sequences.

What is the structure of the chromosome and how does recombination take place? The remaining authors deal with these questions. Higher organisms contain great lengths of DNA coiled up in a remarkably compact form in the condensed chromosomes seen at cell division. The indications are, at least for the lampbrush chromosomes of amphibian oocytes, that chromosomes contain few, and perhaps only two, DNA duplexes running along the length and maintaining axial continuity. Most chromosomes behave genetically, in replication and in joining following breakage, as if based on a single duplex that is replicated during the synthetic period of interphase, but there are notable exceptions in the giant polytene chromosomes of insect salivary glands, which have many hundreds of parallel duplexes.

Recombination has long been one of the favorite topics for investigation by geneticists. It has been argued that recombination may take place by copy choice, by cutting and joining, or by cutting and joining with local copy choice. Bacteriophage crosses are favorable for investigating the molecular mechanisms of recombination, and in phage λ crosses recombinants can be recovered that must have been formed by cutting and joining, although it remains uncertain whether the phage integration system or the phage and bacterial recombination systems was responsible for their production. Bacterial transformation, another form of recombination, appears to depend upon the integration of a single strand of donor DNA. Recombination in higher organisms during meiosis is of particular interest, because all the products of recombination can be recovered and are usually reciprocal, the rare exceptions usually being attributed to the local repair synthesis at the join. Extensive data from meiotic recombination in fungi have been accumulated in the hope of establishing the underlying mechanism, and various models have been proposed. It is widely assumed that mismatched base pairs are recognized by an endonuclease and excised, for this permits the freedom in model building needed to explain any data, yet the experimental tests on this question are most unsatisfying. One can hope that model building has reached its peak and that these models will be displaced as more is learned about the specificities of the pertinent nucleic acid enzymes. The final chapter, by Grell, is concerned with the long-range and short-range forces of chromosome pairing and the role of the synaptinemal complex. The relevant experimental material is reviewed, but the questions cannot be definitively answered.

This book brings together the wealth of experimental material pertinent to the problems of recombination, and can be warmly recommended as an up-to-date, scholarly, and comprehensive treatise. We look forward to the appearance of the subsequent volumes.

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Marine Algae

Biology of Acetabularia. Proceedings of a symposium, Brussels and Mol, Belgium, June 1969. JEAN BRACHET and SILVANO BONOTTO, Eds. Academic Press, New York, 1970. xvi, 304 pp., illus. $10.

When I first read about Hämmerling's experiments with *Acetabularia*, published in the 1930's, I found it hard to believe them. It seemed to me highly improbable that there should exist a plant a few centimeters long but with only a single nucleus at one end. I cannot have been the only person to have such skeptical reservations, because it evidently took 20 years before biochemists awakened to the almost unique potentialities of this remarkably operable organism. Lop off its base, with a pocket knife if you like, and you have an anucleate cell: how simple, and how useful! Furthermore, although they are marine algae, some species of *Acetabularia* aren't hard to grow; indeed, the finest cultures that I've seen were in a laboratory in central Siberia, far from the briny breezes of the Mediterranean or the West Indies where *Acetabularia* swards flourish naturally.

It is to Brachet, more than to anyone else, that we owe this renaissance of interest in a lowly chlorophyte. It is to him, too, that we now are indebted for a stimulating book, the proceedings of a symposium on the subject held in Belgium a little more than a year ago. Congratulations, Academic Press, for getting the book out so expeditiously! In the circumstances, it might be uncharitable to carp at the odd syntax of some of the articles; at least they are all written in English or in what I have heard called "the international language of science, broken English." And Academic Press, or someone, has at least found time to prepare an adequate index, without which it would be difficult to ferret out much of the information in a symposium volume of this sort. I wish, though, that they'd worked a little more on the graphs and tables, many of which I found quite hard to understand, and some of which I suspect we might have done better without.

The title of the book is perhaps a trifle more all-embracing than the content would justify. Some aspects of the biology of *Acetabularia*—its ecology, say—receive little or no attention. What the book does deal with is the fashionable side of biology today: the fine structure of the wall, the plastids and certain other subcellular particles, their fractionation, and their biochemical activities. *Acetabularia* species lend themselves peculiarly well to investigations of morphogenesis; but I have the impression that most of the studies described here have somewhat gingerly skirted the crux of the problem. After all, it's easier to extract and measure the DNA or RNA from plants or fractions subjected to various treatments than it is to find out exactly how they make the little lampshades that characterize this genus.

There are 16 articles, of which 7 are by Brachet and his Belgian colleagues, and 5 by compatriots of Hämmerling, the German father of scientific acetabulariology. I recommend that the "Concluding remarks" by Brachet be read first; they help to put the other contributions into perspective, and to distill the essence of the researches from the "long succession of sucrose gradients" through which the 90-odd participants must have fidgeted for much of the three-day symposium. There are several comparisons of intact and enucleate plants, of course: their endogenous rhythms, their photosynthetic, regulative, and regenerative activities, and their responses to various mistreatments with ethidium bromide, gamma rays, and the like. There are a few dozen fairly good electron micrographs, and some rather poorer macrographs. (I couldn't find a good portrait of the whole plant anywhere in the book—a pity, since it might at least have made a nice frontispiece.)

Since this isn't a textbook or a handbook, there are no recipes or other specifics for the guidance of neophytes, who may be unable to tell Erdschreiber from skywriting. But it's a good book to know about, nonetheless. Reading it, one gets ideas—and that is a recommendation in itself.

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