

more acceptable means of attaining the presumed objective than a possible fragmentation of the next volume into two parts.

Overall, the foregoing may be seen to imply that this volume is of interest primarily to such specialists as food technologists concerned with the proteinaceous, hydrocolloidal, food stabilizers and with structural studies of polysaccharides, but not to most carbohydrate chemists and biochemists, for which it is far less useful.

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*Biotechnology of Marine Polysaccharides:* edited by RITA R. COLWELL, E. R. PARISER, AND ANTHONY J. SINSKEY, Hemisphere Publishing Corporation, Washington, New York, and London, 1985, xi + 550 pages + Subject Index, \$79.95.

This volume is the Proceedings of the 3rd Annual MIT Sea Grant College Program Lecture and Seminar held at the Massachusetts Institute of Technology in April, 1984. It covers a wide range of topics and is by no means restricted to biotechnology. In all, there are twenty two papers, ranging in length from seven pages on exopolymers in fish ponds to sixty three pages on the uses of algal and bacterial polysaccharides. The majority of them report recent research carried out by the authors, but some are more general reviews. They were presented in nine sessions, each dealing with a different group of topics.

Two papers were given in Session 1; the first is on the functions of polysaccharides in biotechnology, and the other is a detailed study of the conformation of carrageenan and alginate in aqueous solution.

In Session 2, three papers dealing with different aspects of marine biofouling processes were given. In the longest paper, the general problem of adhesion of organisms to surfaces was considered, with special reference to *Chlorella*, where associated bacteria were found to be important. Shorter papers dealt with the adhesion of oyster larvae and of bacteria.

Leaving biological problems, Session 3 included two papers on the little understood phenomenon of drag reduction brought about by traces of polysaccharides and other polymers dissolved in water. One was a long and detailed study of fluid flow in different conditions, and the other reported experiments made to apply the effects to ships. Session 4 dealt with the use of polymers in enhanced oil-recovery. The output of oil wells can be increased by pumping a liquid into the oil-bearing strata; the exacting properties of polymers needed to function effectively in the flooding liquid was discussed in one paper. The rather different properties required

in the process of hydraulic fracturing of the rocks were considered in a second report.

In Session 5, three papers were given on different aspects of the production, properties, and uses of chitin and chitosan. A single paper on the uses of carrageenan made up Session 6, entitled "Food Industry". In Session 7, on pharmaceuticals, the first paper of five reviewed the published pharmaceutical effects of products from marine organisms. Another paper dealt with experiments on the antitumour activity of extracts from a number of marine invertebrates. Others reported the extraction of heparin from fish wastes, newly developed monoclonal antibodies to seaweed polysaccharides, and the effect of carrageenan on the growth of cells *in vitro*.

Two papers were given in Session 8, on "Chemical Industries". One considered new techniques which could be used for isolating and separating high-value polysaccharides, while the other was a comprehensive report on the uses of polysaccharides. In the final session, on "Animal Food and Nutrition", one paper dealt with the production and fate of exopolysaccharides in natural waters, and the other showed the importance of exopolysaccharides in the food chain in fish ponds.

The volume presents a great deal of information over a wide range of subjects, and the extensive bibliographies given with all the papers would enable the reader to study most of the topics in greater depth. With a few exceptions, there is little overlap of subject matter, but the structures of the different types of carrageenan are discussed in three separate papers.

The book is well bound and is clearly legible in spite of being printed directly from the authors' typescript, which gives it a rather uneven appearance. There are few typing errors, but the figures do vary in quality, and some of them are rather difficult to interpret. The very diversity of the subject matter and the price of the book militate against its being purchased for a personal library, but it would be a useful addition to an institutional, scientific collection. Although most of the papers would be outside the scope of a conventional course of study, a student could gain from them a wider view in a number of fields.

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