ferences of opinion on such fundamental matters as the relative importance of abrasion and plucking in erosion and the role of subglacial streams. Thus, although Boulton and Hallet have made theoretical analyses of abrasion, a comprehensive theory of erosion seems unlikely to emerge in the near future.

On the practical side, the symposium showed the variety of methods available for tackling the many unsolved problems. Though mathematical analyses and laboratory simulations will continue to be useful, the main need is for more detailed observations in tunnels and boreholes and also on surfaces exposed by retreating glaciers. For example, much can be learned about subglacial processes by mapping features and examining carbonate deposits on such surfaces (Walder and Hallet).

Many textbooks present a tidy picture of their subject by glossing over those awkward observations that do not fit current theories. A symposium volume such as this, on the other hand, emphasizes the areas of ignorance and disagreement. This is the first step to progress, however, and the book should guide the direction of research in the years ahead.

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Biological Membranes

Liposomes in Biological Systems. GREGORY GREGORIADIS and ANTHONY C. ALLISON, Eds. Wiley-Interscience, New York, 1980. xii, 412 pp., illus. $57.

Artificial lipid membrane vesicles, commonly known as liposomes, have been widely used both as experimental models in membrane research and as carrier systems for cellular delivery of drugs and other macromolecules in vitro and in vivo. The use of liposomes as model membranes has resulted in a significant increase in our understanding of molecular dynamics at the cellular level. Though the possible medical application that first attracted attention, enzyme replacement therapy, is still underdeveloped, there are promising new leads with respect to the use of liposomes in the treatment of parasitic diseases, metal poisoning, metal storage diseases, tumors, and rheumatoid arthritis. Genetic manipulation of cells in vitro and in vivo and targeting of liposomes to specific tissues are possibilities now under active development.

It is tempting to say that liposomes started as a cure in search of a disease. With the benefit of hindsight, and in spite of present successes, it seems to me that the problems associated with their eventual utilization in biology and medicine have only recently come into proper focus. It is quite possible that the early enthusiasm may have tempted researchers to downplay the complexities of the biological milieu in which such a simple carrier system was expected to operate. At this stage there is an increasing prospect for numerous useful applications of liposomes, although it has become clear that liposome properties have to be modified significantly to produce optimal results of practical significance. In view of the versatility of the liposome system and the number of investigators now involved in this field, the future looks promising.

This book is devoted exclusively to various biological applications of liposomes. Although the subject is timely, the book itself seems to be about two years out of date. Most of the chapters cover the literature only up to 1977, with some including a few references from 1978 and others missing most references from 1977. The last chapter (by G. Gregoriadis), however, is a brief but reasonably well organized summary of recent progress in various avenues of research.

The book begins with a chapter by A. D. Bangham, who gives a personal account of the early days of the liposome field, followed by a dense compendium of references on liposomes as model membranes, circa 1975–76. In the chapter by Gregoriadis, an account of the author's earlier work on various aspects of liposomes, such as their disposition in tissue, their role as carriers of lysosomal enzymes and drugs, and their adjuvant effects and oral delivery, is followed by a generous sprinkling of recent unpublished results. J. H. Fendler analyzes drug entrapment in liposomes and its possible enhancement by the formation of various complexes. G. Poste reviews the interaction of liposomes with cells in vitro, with an analysis of possible mechanisms of interaction and a discussion of the difficulties of interpreting the data. G. Weissmann and M. Finkelstein review their work with liposomes as enzyme carriers. G. Scherphof *et al.* discuss the interaction of liposomes with plasma components and liver cells. There are papers on liposomes as carriers of methotrexate (H. K. Kimelberg), chelating agents (Y. E. Rahman), and steroids (I. H. Shaw and J. T. Dingle). G. M. K. Humphries discusses the use of liposomes in immunological studies, with a review of the work from the groups of Kinsky and McConnell. Other chapters are authored by T. DeBarsy and F. Van Hoof, W. E. Magee, and I. R. McDougall.

Because of the delay in publication, the book is not likely to enhance the reader's appreciation of the current state of the art. However, by providing an overview of the earlier work of several leading groups, it is likely to be helpful to people just starting in the field. In this respect, it is a useful addition to several other books and reviews on the subject that have appeared during the last few years.

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Books Received

Advances in Agronomy. Vol. 31. N. C. Brady, Ed. Academic Press, New York, 1980. xii, 316 pp. $32.50.

Advances in Environmental Science and Technology. Vol. 10. James N. Pitts, Robert L. Metcalf, and Daniel Grosjean, Eds. Wiley-Interscience, New York, 1980. xviii, 522 pp., illus. $42.50.

Advances in Lipid Research. Vol. 17. Rodolfo Paoletti and David Kritchevsky, Eds. Academic Press, New York, 1980. xii, 308 pp., illus. $31.

Advances in Prostaglandin and Thromboxane Research. Vols. 6–8. Proceedings of a conference, Washington, D.C., May 1979. Bengt Samuelsson, Peter W. Ramwell, and Rodolfo Paoletti, Eds. Raven, New York, 1980. cxxxviii, 1856 pp., illus. Each volume, $55; the three volumes, $160.

Basic Chemical Kinetics. H. Eyring, S. H. Lin, and S. M. Lin. Wiley-Interscience, New York, 1980. x, 494 pp., illus. $35.

Bifurcation and Nonlinear Eigenvalue Problems. Proceedings of a meeting, Villetaneuse, France, Oct. 1978. C. Bardos, J. M. Lasry, and M. Schatzman, Eds. Springer-Verlag, New York, 1980. viii, 296 pp., illus. Paper, $19.50. Lecture Notes in Mathematics, vol. 782.

Cereals for Food and Beverages. Recent Progress in Cereal Chemistry and Technology. Proceedings of a conference, Copenhagen, Aug. 1979. George E. Inglett and Lars Munck, Eds. Academic Press, New York, 1980. xiv, 558 pp., illus. $39.50.

Chemical Experimentation under Extreme Conditions. Bryant W. Rossiter, Ed. Wiley-Interscience, New York, 1980. xiv, 370 pp., illus. $24.95. Techniques of Chemistry, vol. 9.

Dynamics of Mechanical Systems. J. M. Prentis. Horwood, Chichester, England, and Halsted (Wiley), New York, ed. 2, 1980. x, 486 pp., illus. $57.95. Ellis Horwood Series in Engineering Science.

EDP Costs and Charges. Finance, Budgets, and Cost Control in Data Processing. James W. Cortada. Prentice-Hall, Englewood Cliffs,

(Continued on page 1379)