

erosion. Microbial metabolic activities and chemical by-products accelerate weathering processes and soil formation.

By acting, then, as catalysts and geochemical gatekeepers, microorganisms do much to control the global chemical cycles that shape the sedimentary record. This form of microbial domination persists even today, on a planet teeming with multicellular plants and animals. For most of Earth's history, however, there was no contest; all biology was microbial.

For those good reasons, geochemists concerned with low-temperature processes ought to be as interested in bacteria as in the source of their next pay cheque. Some good books are now appearing in the prefix-laden field of biogeochemistry, but the subject draws upon so many disciplines that few authors are attempting large-scale syntheses. In 1979 T. Fenchel and T.H. Blackburn provided us with a superb textbook (*Bacteria and Mineral Cycling*, published by Academic Press), and now Wolfgang Krumbein, a most engaging exponent of modern studies in geomicrobiology, has assembled an outstanding group of authors to review aspects of microbial geochemistry.

The volume includes some particularly notable contributions. K. H. Neelson provides beautifully documented reviews of the microbial iron and manganese cycles, J. Berthelin discusses microbial weathering processes in similar detail, and a chapter by C. D. Curtis outlines the roles of microorganisms in diagenesis of sediments. In each case, diverse lines of evidence have been pulled together to provide a unique and authoritative view of the subject.

The Institute of Ecology and Genetics at the University of Aarhus, Denmark, is currently one of the most active centres for research in sedimentary microbiology. To the large number of excellent papers coming from that laboratory we must now add chapters in this book by T. H. Blackburn, on microbial nitrogen cycling, and by B. B. Jorgensen on microbial sulphur cycling. The former emphasizes mineralization — a welcome change from most other reviews — and the latter helpfully expands on previous treatments, although, falling as it does in a particularly active area, it suffers slightly from the evident lapse of time between its preparation and the appearance of the book.

An otherwise lucid review of microbial palaeontology written by A.H. Knoll and S. M. Awramik suffers even more strongly from the same problem. The volume is completed by a discussion of microbial carbon cycling by Krumbein and P. K. Swart, and a very nicely illustrated chapter on silica cycling, by Krumbein and D. Werner. □

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Renewal of surface activity

Pasupati Mukerjee

Surfactant Systems: Their Chemistry, Pharmacy and Biology.

By D. Attwood and A.T. Florence.

Chapman & Hall/Methuen: 1983.

Pp. 794. £45, \$99.

SURFACTANT science, in its widest sense, is a part of a large number of academic disciplines, and deals with a wide variety of biological and other natural systems, and industrial operations. The original objective of the authors in writing this book was to revise a useful monograph, *Solubilization by Surface-Active Agents* by P.H. Elworthy, A.T. Florence and C.B. McFarlane, published in 1968 but now out of print. This revised version, however, is a much larger volume and of considerably greater scope. Surfactants are defined rather broadly — typical amphipathic substances with flexible chains such as soaps and detergents, and membrane lipids are included, as also are physiological surfactants, such as bile salts, and a variety of drugs which display interesting surface-chemical and colloidal properties.

The authors' coverage of the various sub-topics is relatively unorthodox. The first three chapters consider general aspects of surface activity, phase behaviour of surfactants and problems of self-association and micelle formation. Chapter 4, the longest in the book, deals with the surface activity and colloidal properties of drugs and some naturally occurring substances. Solubilization is discussed as a general phenomenon and its areas of pharmaceutical application are covered. Chapter 7 is devoted to some implications of the role of surfactants in formulations, including their effects on

drug dissolution, membrane permeability and drug absorption, after which there are two chapters on emulsions and suspensions and an account of some selected toxicological aspects of surfactants. The concluding chapter, on reactivity in surfactant systems, includes a brief treatment of aspects of chemical and photochemical reactivities of solubilized species as well as of the chemical stability of surfactants themselves. Much emphasis has been placed on commercial non-ionic surfactants, which are chemically heterogeneous but which are used extensively because of their compatibility with physiological systems.

The book is aimed at final-year students of pharmacy and at

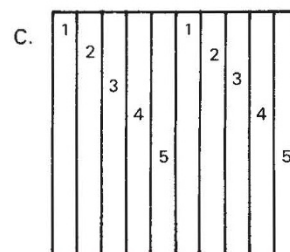
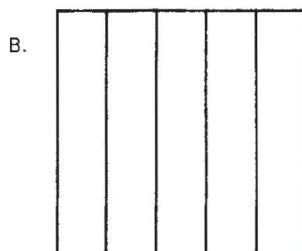
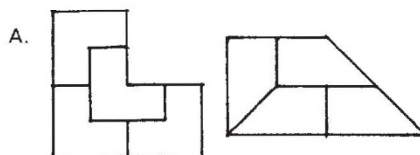
... post-graduate students of pharmacy, biochemistry, biology, chemistry, and those working in industrial research and development laboratories exploring the value or problems of surfactant systems.

Yet I do not believe this volume can be described either as a good textbook or as a critical monograph. The literature is covered in too descriptive a manner — in many cases where an evaluation of opposing points of view might have been desirable, the authors have merely stated those points of view and have left readers the task of making their own conclusions. On the other hand, the literature has been covered extensively. There are 2,427 references at the end of the chapters, only a small fraction of which are repeated. So while I feel that the authors have fallen short of their primary goal, the book is likely to be of considerable value for reference and as a review of the literature, particularly for those who are interested in surface activity of drugs and the formulation and use of medicinal products containing surfactants. □

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Divisive difficulties from David Singmaster — the solutions

Answers to the three problems appearing on p. 521 of Nature, 9 August.



The preceding question was designed to mislead you! It did *not* say the areas must be congruent to the original area.

Here the square is divided into five areas, but each area has two parts. The question did *not* say that the areas must be connected (but did state that many people would find this solution unacceptable!). If one insists on connected areas, it is not known whether there is any way to divide a square into five (or even three) congruent parts.