The Problem of Patchiness

Spatial Pattern in Plankton Communities. Proceedings of a conference, Erice, Italy, Nov. 1977. JOHN H. STEELE, Ed. Plenum, New York, 1978. x, 470 pp., illus. $42.50. NATO Conference Series IV, vol. 3.

There are few water-column ecologists today who fail to recognize that the complex and confounding problem of discontinuous distribution of animal communities affects every aspect of their investigations, from sampling, systematics, and interpretation of experimental results to modeling and the development of ecological theory. This volume, the product of a conference organized by John Steele, goes some way toward establishing a basis for a set of approaches to dealing with the problem. In so doing, and perhaps more important, it elevates the all-pervasive irritant to the level of a structured subdiscipline of biological oceanography.

In the first sentence in his introduction, Steele expands the scope of the symposium from the spatial patterns indicated in the title to include the various facets of food chains and life cycles that interact to produce temporal patterns, spatial patterns being, after all, simply single frames in the temporal sequence. The spatial pattern of the book itself is to begin by concentrating on predominantly physical factors, such as advection, shear, and turbulence, as mechanisms that can create patchy distributions of inert particles starting from homogeneous initial conditions. Then come a series of papers on phytoplankton distributions and a variety of numerical methods for analyzing them, including fluorescence or particle-counter techniques, which can provide something close to the real-time and continuous records that are obtainable for physical oceanographic parameters. From here the contributions work their way rapidly up the food chain, with zooplankton and larval and older fish being represented by single contributions, this reflecting the lack of processed field data as organisms get larger and more dilute. The volume is rounded out by contributions that compare freshwater and terrestrial systems for the benefit of the marine scientist and finally a chapter that, beginning from the position that the "basic issues [of spatial pattern] are fundamental ones in all ecosystems," sets the marine water column in a more general ecological context.

I was impressed by the effort that seems to have been put forth by all the contributors both to provide reviews of how their particular areas of research have arrived at their present state and to make meaningful reference to the work of the other authors. They manage to bring cohesion to a subject so broad that a book on it could very easily become a series of hopelessly disjointed reports. I suspect that the limitation of the conference to some 60 participants helped in this respect.

To my mind there are a few striking omissions, rectification of which would have helped round out the treatment of higher trophic levels, particularly with regard to temporal patchiness. For instance, there is no contribution devoted to the long-time-scale records of the Hardy Recorder surveys or to the records of changing fish stocks. But then the title of the volume does not promise such coverage.

For marine ecologists, this is a very useful collection of papers, more so in some ways for the treatment of subjects outside this immediate area of expertise. It surprised me to find, for instance, that patchiness problems are not much different in other ecosystems. Besides this, there are many interesting insights and useful bits of information buried in the fine print.

MICHAEL R. REEVE
Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, Florida 33149

Surface Phenomena

Topics in Surface Chemistry. Proceedings of a symposium, Bad Neuenahr, Germany, Sept. 1977. ERIC KAY and PAUL S. BAGUS, Eds. Plenum, New York, 1978. viii, 408 pp., illus. $42.50. IBM Research Symposia Series.

This symposium volume contains 15 papers on various aspects of surface chemistry and physics. Five topics are treated: surface studies in electrochemical systems, ordered arrays of organic molecules at surfaces and interfaces, atomic and molecular scattering from surfaces, aspects of surface chemical bonding, and optical excitations at surfaces. The selection of topics is both imaginative and knowledgeable, and the quality of the papers is high.

One of the recurrent themes is photochemistry at interfaces. R. Memming reviews the energy-band model used to predict charge transfer between a semiconductor electrode and a redox system and considers the conditions for the successful use of semiconductor-electrolyte combinations for light (solar) energy conversion. It is of course the surface region that provides the electric potential difference necessary for charge separation. A quite different type of interface with the same capability exists in the aqueous micellar solutions discussed by M. Grätzel. The micelles are spherical agglomerates formed by radially oriented surfactant molecules that have the polar group facing the surrounding aqueous phase. Solutions can be prepared with a sufficiently large potential drop across the boundary to effect a separation of positive and negative charges produced inside the micelles by radiation. Yet a third type of interface with special photochemical properties is described by D. Möbius. Techniques have been developed for the assembly of ordered monolayers of selected organic molecules, such as fatty acids and dyes. These layers can then be stacked into units that perform such functions as light-induced electron transfer and energy transfer. B. Tiecke and G. Wegner report on other attempts at two-dimensional molecular engineering, by ultraviolet-induced polymerization of diacetylenes.

Catalysis is considered by many of the authors. A. Bewick and M. Fleischmann conclude their paper on the electrochemical investigation of surface compound formation with some examples of in situ deposition of the catalyst. The paper by M. Cavallini is devoted to a discussion of the catalytic oxidation of carbon monoxide on palladium and platinum, studied by molecular beam techniques. In a very readable paper, T. Edmonds and J. J. McCarroll examine some cases in which catalytic processes have been developed or improved with the aid of modern surface techniques such as LEED (low-energy electron diffraction spectroscopy) and XPS (x-ray photoemission spectroscopy). The authors make the point, however, that industrial catalysis used to be a secretive art and may now become a secretive science.

Surface scattering of atoms and molecules is reviewed by H. Wilsch, and U. Gerlach-Meyer and E. Hulpke give a progress report on low-energy (5 to 25 electron volts) ion scattering. J. K. Sass describes work on photoelectron emission into electrolytes, A. M. Bradshaw and D. Menzel review photoelectron spectroscopic (UPS [ultraviolet photoemission spectroscopy] and XPS) studies of adsorbed layers, and S. Andersson discusses results for surface vibrations obtained by electron energy-loss spectroscopy. The section on optical ex-