

ion transport, experimental papers on nerve membranes and photoreceptors and on membrane noise and fluctuations, and papers both theoretical and experimental on photosynthesis. Several papers struck me as worth commenting on separately.

M. J. Sparnaay provides an excellent introduction to the physical chemistry of thin films at interfaces. He makes a logical, step-by-step progression from sub-monolayer films (films in which the molecules at the interface are far apart) through coherent monolayers of rod-shaped molecules (such as lipids) to bilayers. At each stage the appropriate formalism is clearly introduced. The paper deserves careful reading.

J. Garnier and S. J. Singer discuss the "bilayer couple hypothesis." They cite evidence that membrane components are asymmetrically distributed and note that changing the area of the inside monolayer of a red cell (or other) membrane relative to that of the outside monolayer can cause the membrane to change shape. True enough, but the authors do not introduce even the most elementary quantitation to support their geometric interpretation of the investigation of the shape changes they find induced by different drugs. In fact, as has been shown by E. A. Evans (*Biophys. J.* **14**, 923 [1974]) and others, anything that alters either the compressibility or the surface tension of one monolayer with respect to another will cause a shape change. Failure to consider this point of view considerably reduces the value of the interesting data provided by Garnier and Singer.

W. W. Webb's paper on the lateral diffusion of molecules in various types of bilayers and cell membranes is a fine introduction to an important line of work that will be vigorously pursued for some time. The complementary techniques of fluorescence correlation spectroscopy and photobleaching get good introductory treatments, but readers wanting the details will have to dig further (a voluminous list of references is provided). Useful summaries of important numerical results for the diffusion constants of various molecules, including acetylcholine receptors, appear in several tables, but some of the numbers, especially for lipid bilayers, have been updated since Webb's paper was written.

Of the several papers on fluctuations, that by C. P. Bean and D. C. Golibersuch is particularly elegant and novel. It takes a different point of view from that current in neurophysiological literature, where fluctuations in conductance are used to deduce properties of conducting

channels. Bean and Golibersuch use physically well-characterized systems and show how the properties of the system explain the observed noise. The paper should be read by anyone working on fluctuations. J. de Goede and A. A. Verveen comprehensively review fluctuations in biological membranes.

Photosynthesis is well covered. J. J. Hopfield provides a lucid discussion of electron transfer in biological membranes and points out exactly why the process is important. H. T. Witt discusses the role of the electric field in photosynthesis. He cites evidence that light can generate an electric field across the membrane and that an electric field, induced externally, can generate adenosine triphosphate.

There are a number of other interesting papers, including several on conductance mechanisms in lipid bilayers (especially that by G. Boheim, H.-A. Kolb, E. Bamberg, H.-J. Apell, H. Alpes, and P. Läuger) and several on nerve membranes (notably those of E. Rojas, B. Neumcke, and C. Bergman and J. M. Dubois). These and the others mentioned are worth reading.

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## Developmental Biology

**The Cell Surface in Animal Embryogenesis and Development.** GEORGE POSTE and GARTH L. NICOLSON, Eds. North-Holland, Amsterdam, 1976 (U.S. distributor, Elsevier, New York). xxiv, 766 pp., illus. \$89.95. Cell Surface Reviews, vol. 1.

The series this volume inaugurates will, the editors envision, be different from other, more eclectic review series in that each volume will be a coordinated collection of articles concerned with a well-defined topic. In the first volume, a coherent and heuristic survey of the cell surface in development, this goal has been achieved.

Composed of 13 chapters, the book reviews fertilization, cleavage, implantation, placentation, and three selected examples of organogenesis. There are also three outstanding chapters on more general developmental topics—cell motility, induction, and positional information.

The chapter on metazoan cell movements by Trinkaus provides a comprehensive account of observations of motility in vivo. Although the chapter is over a hundred pages long, the reader's

interest is maintained by the author's clear and insightful presentation. Similarly, Saxén and co-workers provide an extensive and lucid review of the many inductive tissue interactions that characterize embryonic development. Although these chapters are both predominantly phenomenological, their value may well be greatest to prospective biochemists who are able to discern the direction that such imposing arrays of observation may suggest.

The most speculative chapter, by McMahon and West, not only reviews observations and ideas relevant to positional information, but provides a new perspective from which to view the establishment of patterns during development. The authors propose that the transduction of cell surface events, such as cell-to-cell contact, results in temporally and spatially specific variations in the concentrations of simple "metabolic messengers." They then suggest that these messengers (adenosine triphosphate or S-adenosylmethionine, for example) determine modifications in a cell's macromolecules by, for instance, phosphorylation, acetylation, or methylation. Some of these modifications, they propose, are permanent enough to provide a "memory" of a cell's developmental experiences. The ultimate pattern of genetic expression might then result from an interpretation of this macromolecular repository.

The volume has few scientific weaknesses, although speculation and fact seem confusingly mingled in the chapter on fertilization. For the most part, the chapters are freshly conceived and do more than rehash previous reviews. The reference lists are slightly dated, generally not extending beyond early 1975, but they are exhaustive—more than half contain over 200 citations. The book has a detailed table of contents and an adequate index.

These attributes are severely undercut, however, by the price of the volume. The book is carefully produced but sparingly illustrated, except for the chapters by Ede on limb development and Manasek on heart development. The price, more than four times that of the 1120-page 1977 *Annual Review of Biochemistry*, seems unjustified. It will clearly limit the distribution of a book that might otherwise have become a valuable addition to graduate students' reading lists and researchers' personal libraries.

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