A Dynamic Structure

The Cell Surface in Development. Papers from a symposium, Montreal, Aug. 1973. A. A. MOSCONA, Ed. Wiley, New York, 1974. xiv, 334 pp., illus. $24.

In many cases rapid developments make a symposium proceedings out of date before it is published. Not so in this case. Certainly cell surface membrane research is a very active area, and new findings, books, and reviews emerge with distressing frequency. This book, however, cuts across the mainstream of membrane research, focusing on the broad biological implications and roles of the cell surface. This breadth gives one a sense of order in the midst of rapid change.

Moscona points out in the preface to this volume that developmental biologists have long viewed the cell surface as a dynamic structure. This undoubtedly reflects an intuitive understanding of the necessity for a dynamic, changing cell surface to account for the plasticity of development. It is only fitting that those interested in the plasma membrane in development should assist in redirecting attention to the cell surface as a dynamic structure.

Clearly, not all areas of developmental biology in which the cell surface plays a critical role could be included in a single volume. Sperm-egg interactions, invertebrate development, induction, and topoinhibition of cell growth and movement are but a few of the major areas that have not been discussed. The organizers have made an outstanding selection, however. The 16 papers that are included highlight representative areas of plasma membrane and developmental biology research.

The papers range from one on the biophysics and structural asymmetry of artificial lipid vesicles (T. E. Thompson *et al.*) to one that presents a theory relating development and cancer (N. G. Anderson and J. H. Coggin). In between, the spectrum of topics covered can be broadly categorized, from a membrane viewpoint, as methodological (physical, chemical, genetic, immunological, descriptive, or biological). A different categorization is possible if one has a developmental perspective. The foci here are differentiation (differential gene expression), morphogenesis (tissue formation), intercellular communication, and the causes of and changes resulting from malignancy. Most of the authors have presented their subjects with a broad, multidisciplinary readership in mind. This is not a volume for those interested in details of methodology, but it is highly recommended to workers in search of functional significance for cell surface membrane research.

One flaw of the volume is its failure to assess adequately the state of cell surface membrane isolation and analysis. The paper on membrane structure by M. Bretscher evaluates structures deduced from the red cell membrane and extrapolates to other membranes. Alas, not all cell surface membranes are so easily isolated and analyzed. It might have been judicious to include a paper dealing with the many problems encountered by workers wrestling with the surface of more obstinate cell types. (For reviews, see D. F. H. Wallach and P. S. Lin, *Biochim. Biophys. Acta* **300**, 211 [1974], and J. W. De Pierre and M. L. Karnovsky, *J. Cell Biol.* **56**, 275 [1973].)

This volume is printed on high-quality glossy paper, and the illustrations, print, and electron micrographic reproductions are exceptional.

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Bernard's Real Methods

Claude Bernard and Animal Chemistry. The Emergence of a Scientist. FREDERIC LAWRENCE HOLMES. Harvard University Press, Cambridge, Mass., 1974. xxii, 542 pp., illus. $18. A Commonwealth Fund Book.

The lasting fame of Claude Bernard (1813–1878) derives only partly from his monumental contributions to physiology. At least as important to his later reputation was his *Introduction to the Study of Experimental Medicine* (1865), long regarded as a classic expression of the "scientific method" by one of its leading practitioners. The *Introduction*, written in spare, lucid prose, attracted an audience extending far beyond the scientific community and won its author a place in the Académie Française. It promoted Bernard's vision of a medicine based increasingly on experimental physiology; offered his nuanced concept of "determinism" as a *via media* between vitalism and mechanism; and enlisted "case histories" from his own research in support of his methodological precepts. In general, Bernard insisted, scientists should allow their imagination "free scope" in the construction of hypotheses, but should then submit them to rigorous criticism and counterproof, ready always to abandon any hypothesis that fails to conform to the evidence.

Happily for historians of science, who have long distrusted such idealized prescriptions for scientific research, Bernard left behind an extensive set of laboratory notebooks. Recently, part of this material was put to admirable use in M. D. Grmek's impressive *Raisonnement expérimental et recherches toxicologiques chez Claude Bernard* (Droz, Geneva, 1973). Grmek's general admiration for Bernard's *Introduction* does not extend to its personal "case histories," perhaps because Grmek's own careful research shows that Bernard's work on poisons (notably curare and carbon monoxide) followed a developmental pattern infinitely more complex than the tidy, logical pattern imposed upon it in the *Introduction*. Now Frederic Holmes, in an important book already going to press when Grmek's appeared, reaches a similar conclusion vis-à-vis Bernard's early work in digestive physiology. Also using the laboratory notebooks as his point of departure, Holmes provides a remarkably detailed, persuasive, and revealing reconstruction of Bernard's research on digestion between 1842 and 1848. During the last two of these years Bernard made his two most important discoveries in the field—the fat-digestive properties of pancreatic juice and the glycogenic function of the liver. In demonstrating that neither discovery will fit the route assigned it in Bernard's *Introduction*, Holmes joins Grmek in suggesting that the didactic-cum-methodological aims of this work led Bernard unconsciously to telescope and simplify the process of discovery.

More generally, Holmes reveals a Bernard who sometimes followed his own methodological precepts but at other times did not—who sometimes pursued hypotheses in the face of powerful evidence against them, and whose published papers sometimes transformed equivocal experimental results into decisive ones or reversed the order in which experiments had actually been performed. From Holmes's account, historians of science will perceive anew the frailty of interpretations based solely on the published record.

Perhaps the most deep-seated of Bernard's methodological precepts was