his insistence that the physiological approach in general, and vivisection experiments in particular, offered a more reliable guide to the investigation of vital phenomena than did the chemical approach. Unlike most students of Bernard, Holmes examines this position critically and concludes that Bernard simply assumed that what worked best for him would work best for others. In fact, Bernard's two major discoveries in digestive physiology depended primarily on his operative skill and ingenuity, and both came only after he had devoted almost five years of frustratingly inconclusive work to the problem of gastric digestion, where his modest chemical talents proved unequal to the challenge. To establish this point, Holmes describes the years of Bernard's travail with gastric digestion at least as fully as he does the two subsequent, triumphant years. Holmes also stresses the achievements as well as the shortcomings of Bernard's chemical rivals, and his scrupulously balanced handling of controversies sets his book apart from any previous study of Bernard. So does his richly detailed account of the scientific context, which illuminates the ways in which Bernard sometimes surpassed, sometimes lagged behind, and sometimes depended upon his scientific contemporaries.

Even the most sympathetic reader may wonder, however, whether Holmes could not have accomplished his aims in much less space with greater economy and force of expression. Indeed, Bernard appears so rarely in the first half of the narrative (after the introduction he disappears until chapter 6, and then again until chapter 10) that inattentive readers may sometimes forget that he is the central figure in the story. Perhaps no general intellectual historian, very few philosophers of science, and too few historians of science will have the patience (or technical competence) to wade through this part of the book in order to reach those chapters (especially 17 through 20) where the pace accelerates and where the subtlety and importance of the long prelude suddenly becomes manifest.

Holmes obviously recognizes the difficulty, warning that his "exposition of details . . . may sometimes grow tedious." But he insists that "tedium is itself an essential side of scientific research . . . and it is difficult to sense the quickening pace at climactic moments if one has not felt the slowness of movement during the interludes between them" (p. xvii). In the end, Holmes refuses to compromise either technical rigor or wealth of contextual detail for the sake of a wider readership. That is a defensible, perhaps even brave, response to a problem faced by any historian of science whose material is inherently technical. Unfortunately, it will severely restrict communication with those who perhaps most need to know why Holmes clearly and responsibly doubts the influence on Bernard of general philosophical currents, and why he rejects the view that Bernard's research suddenly hit stride when he discovered, or adopted, some quasimagical "scientific method." To spread that message widely, another vehicle will almost certainly be required. But those who are patient, technically prepared, and fascinated by Claude Bernard or the science of his time should find a prominent place on their shelves for Holmes's distinguished book. It will remain there for a long time to come.

GERALD L. GEISON
*Program in History and Philosophy of Science, Princeton University, Princeton, New Jersey*

## Amphibian Genetics

**The Control of Gene Expression in Animal Development.** J. B. GURDON. Harvard University Press, Cambridge, Mass., 1974. x, 160 pp., illus. $6.50.

The major part of this book consists of a detailed summary of the elegant and important work from the author's own laboratory on the early development of amphibians. It is an outgrowth of a popular three-lecture series Gurdon presented at Harvard last year, and the book follows the lectures rather closely. The first chapter deals with transplantation of nuclei from somatic cells into enucleated eggs and the evidence that stable, qualitative changes in the genome do not take place during the course of amphibian cell differentiation. The second deals with translational control of protein synthesis and the microinjection of messenger RNA (mRNA) into living oocytes and eggs. It reviews the evidence that shows that oocytes will not only translate faithfully and at very high efficiency any added eukaryotic mRNA but also can modify or process properly the protein product. The third chapter deals with the control exerted by the cytoplasm of eggs and oocytes over RNA and DNA synthesis by injected nuclei. Among the important results summarized here is that the cytoplasm of eggs contains some component that can "turn off" ribosomal RNA synthesis in a normally active nucleus. A good many experimental data are given in figures and tables, and in a welcome appendix there is a detailed description of the microinjection technique. The discussion and interpretation of the author's own work are unusually complete and articulate.

Perhaps inevitably, because of its small size, this book is much less successful in its treatment of other areas of developmental biology. Much of the background sections is written in a rather terse style, and many crucial experiments are described in little detail. Although there is a detailed glossary, defining such terms as "actinomycin," "activation of an egg," "adenocarcinoma," and "allele," the author assumes a good background on the part of the reader. Some of the discussion of the genetic analysis of adult nuclear-transplant frogs in chapter 1 makes intricate reading for the nonspecialist. Many important topics—for instance, RNA-DNA hybridization and the function of the various types of DNA sequences within the chromosomes—are discussed very briefly.

This book is warmly recommended for advanced students in cell biology or developmental biology. It would make an excellent supplementary text for an undergraduate course in developmental biology.

HARVEY F. LODISH
*Department of Biology, Massachusetts Institute of Technology, Cambridge*

## Organic Semiconductors

**Energy and Charge Transfer in Organic Semiconductors.** Proceedings of a seminar, Osaka, Japan, Aug. 1973. KOHZOH MASUDA and MARVIN SILVER, Eds. Plenum, New York, 1974. x, 200 pp., illus. $18.50.

The papers collected in this volume are of interest to the physics and chemistry community as indicators of the status of a potentially important field of research. For the reader who is willing to dig and sift through a series of terse articles by specialists, the book provides a sampling of the understanding of organic semiconductors (as of August 1973) upon which further

progress in this field is being built.

The three general themes of the conference can be roughly described as excitons in anthracene (energy transfer in organic semiconductors), electrons in tetracyanoquinodimethane (TCNQ) salts (charge transfer), and photoconductivity in polyvinyl *n*-carbazole. The work on anthracene represents a mature field that has benefited from the considerable progress in sample purification and the measurement of a wide variety of properties that has been made over the past decade. The work related to TCNQ salts features a review by H. Kuroda of the rapidly expanding efforts in Japan and a presentation by A. N. Bloch, D. O. Cowan, and T. O. Poehler of their discoveries of properties of dimethyltetrathiofulvalinium-TCNQ—which include the largest electrical conductivity of any organic compound known at the time.

A section of the book is devoted to what the book jacket calls a "crucial topic," superconductivity. As the contributors explain, however, there is no evidence for superconductivity in any organic compound studied. (There is still none at this writing.) W. A. Little sounds a cautious note with respect to possible compounds (as yet unfabricated), but devotes most of his paper to a readable discussion of what superconductivity is and how it, and other electronic properties, are generally affected by highly anisotropic materials such as the TCNQ complexes. Perhaps the most optimistic comment that can be made at this time about superconductivity in organic compounds is that the myriad combinations of materials possible in this class make it appear that almost any property can be achieved. However, there may be intrinsic physical and chemical restrictions, such as collective electronic instabilities.

With regard to practical applications, it can be concluded on the evidence of these papers that the materials will not be ready in time for installation of organic semiconductor devices or organic cables in next year's Cadillacs. On the other hand, as the study of disorder by A. N. Bloch shows, there has certainly been some good science done, and, as J. Mort of Xerox suggests in reference to the class of polymer compounds now used in the IBM copier, more applications will certainly be found in the not too distant future.

GORDON A. THOMAS
*Bell Laboratories,*
*Murray Hill, New Jersey*

## Books Received

**Advances in Comparative Physiology and Biochemistry**. Vol. 5. O. Lowenstein, Ed. Academic Press, New York, 1974. xii, 198 pp., illus. $21.50.

**Advances in Enzymology**. And Related Areas of Molecular Biology. Vol. 41. Alton Meister, Ed. Interscience (Wiley), New York, 1974. viii, 364 pp., illus. $20.95.

**Advances in Quantum Chemistry**. Vol. 8. Per-Olov Löwdin, Ed. Academic Press, New York, 1974. xviii, 292 pp., illus. $32.50.

**Advances in Solid State Physics**. Papers from a meeting, Freudenstadt, Germany, April 1974. H. J. Queisser, Ed. Pergamon, Elmsford, N.Y., and Vieweg, Braunschweig, Germany, 1974. viii, 310 pp., illus. $33.75. Festkörperprobleme, 14.

**Agricultural Meteorology of Japan**. Published for the 30th Anniversary of The Society of Agricultural Meteorology of Japan. Yoshiaki Mihara, Ed. University Press of Hawaii, Honolulu, 1974. xii, 216 pp., illus. $20. An East-West Center Book.

**Air Pollution Abatement and Regional Economic Development**. William H. Miernyk and John T. Sears. Lexington Books (Heath), Lexington, Mass., 1974. xviii, 196 pp., illus. $13.50.

**Biological Bases of Sexual Behavior**. Gordon Bermant and Julian M. Davidson. Harper and Row, New York, 1974. xiv, 306 pp., illus. Paper, $7.95. Animal Behavior Series.

**Cell Wall Deficient Forms**. Lida H. Mattman. CRC Press (Chemical Rubber Co.), Cleveland, 1974. xii, 412 pp., illus. $44.95.

**The Chemistry of PCB's**. O. Hutzinger, S. Safe, and V. Zitko. CRC Press (Chemical Rubber Co.), Cleveland, 1974. x, 270 pp., illus. $35.

**Cichlid Fishes of Lake Victoria, East Africa**. The Biology and Evolution of a Species Flock. P. H. Greenwood. Trustees of the British Museum (Natural History), London, 1974. vi, 134 pp., illus. £6. Reprinted from the *Bulletin* of the British Museum (Natural History), Zoology Series, Supplement 6.

**The Collector's Encyclopedia of Shells**. S. Peter Dance, Ed., with photographs by Ian Cameron. McGraw-Hill, New York, 1974. 288 pp. $19.95.

**Colloque International sur la Synthèse Normale et Pathologique des Protéines chez les Animaux Supérieurs**. International Symposium on Normal and Pathological Protein Synthesis in Higher Organisms. Proceedings of a symposium, Paris, May 1973. Institut National de la Santé et de la Recherche Médicale, Paris, 1973. xii, 508 pp., illus. Paper, 50 F. Colloques et Séminaires.

**Dual Resonance Models**. Paul H. Frampton. Benjamin, Reading, Mass., 1974. xxiv, 452 pp., illus. Paper, $14. Frontiers in Physics, No. 45.

**An Early Middle Eocene Flora from the Yellowstone-Absaroka Volcanic Province, Northwestern Wind River Basin, Wyoming**. H. D. MacGinitie with chapters by Estella B. Leopold and W. L. Rohrer. University of California Press, Berkeley, 1974. vi, 104 pp. + plates. Paper, $5.75. University of California Publications in Geological Sciences, vol. 108.

**Energy Policy Evaluation**. Modeling and Simulation Approaches. Papers from a workshop, San Diego, Calif., Nov. 1973. Dilip R. Limaye, Ed. Lexington Books (Heath), Lexington, Mass., 1974. xiv, 218 pp., illus. $14.

**Environmental Education**. Strategies Toward a More Livable Future. James A. Swan and William B. Stapp, Eds. Sage, Beverly Hills, Calif., and Halsted (Wiley), New York, 1974 (distributor, Halsted). 350 pp., illus. $15.

**Equipment for Vector Control**. World Health Organization, Geneva, 1974 (U.S. distributor, Q Corporation, 49 Sheridan Ave., Albany, N.Y.). 180 pp., illus. $8.50.

**Finite-Dimensional Vector Spaces**. Paul R. Halmos. Springer-Verlag, New York, 1974. viii, 200 pp. $7.95. Undergraduate Texts in Mathematics. Reprint of the second edition.

**Flight through the Ages**. A Complete, Illustrated Chronology from the Dreams of Early History to the Age of Space Exploration. C. H. Gibbs-Smith. Crowell, New York, 1974. 240 pp. $17.95.

**The Foundations of Mechanics and Thermodynamics**. Selected Papers. W. Noll. Springer-Verlag, New York, 1974. x, 326 pp. $20.10.

**Green Revolution**. M. S. Randhawa and twelve others. Halsted (Wiley), New York, 1974. xvi, 208 pp. + plates. $9.50.

**Gynecology**. A Textbook for Students. Fritz Beller, Karl Knörr, Christian Lauritzen, and Ralph M. Wynn. Springer-Verlag, New York, 1974. x, 386 pp., illus. Paper, $12. Springer Study Edition.

**Handbook of Microbiology**. Condensed Edition. Allen I. Laskin and Hubert A. Lechevalier, Eds. CRC Press (Chemical Rubber Co.), Cleveland, 1974. xii, 930 pp., illus. Paper, $14.95.

**Handbook of Microbiology**. Vol. 4, Microbial Metabolism, Genetics and Immunology. Allen I. Laskin and Hubert A. Lechevalier, Eds. CRC Press (Chemical Rubber Co.), Cleveland, 1974. xvi, 904 pp., illus. $39.95.

**Heat Transfer in Fires**. Thermophysics, Social Aspects, Economic Impact. Papers from a meeting, Trogir, Yugoslavia. Perry L. Blackshear, Ed. Scripta, Washington, D.C., and Halsted (Wiley), New York, 1974 (distributor, Halsted). xii, 516 pp., illus. $28.50. Advances in Thermal Engineering, 1.

**Heat Transfer in Flames**. Papers from a meeting, 1973. N. H. Afgan and J. M. Beer, Eds. Scripta, Washington, D.C., and Halsted (Wiley), New York, 1974 (distributor, Halsted). viii, 502 pp., illus. $28.50. Advances in Thermal Engineering, 2.

**Heterogeneous Catalysis**. Principles and Applications. G. C. Bond. Clarendon (Oxford University Press), New York, 1974. x, 120 pp., illus. $10.50. Oxford Chemistry Series.

**Highlights of Organic Chemistry**. An Advanced Textbook. William J. le Noble. Dekker, New York, 1974. xx, 976 pp., illus. $19.50. Studies in Organic Chemistry, vol. 3.

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