

merit, and range from stimulating to boring. Unfortunately, a large proportion of the papers have little new or suggestive to communicate. Too many authors present little information that enhances our understanding of how the cell cycle operates or what its role in differentiation might be. Several authors working with either plant or animal systems are content with merely comparing changes in duration of the cell cycle and its component parts in different regions of a given organism or in different stages of development. Such information, although important for subsequent experimentation, is too often presented as isolated observations which have little meaning for readers not working in the immediate area under discussion.

In contrast, several contributions describe inventive approaches or provide new and provocative information regarding the cell cycle and its possible relation to differentiation. For example, the idea that histone synthesis and DNA synthesis are necessarily tightly coupled is questioned by Giudice, who presents evidence that, during oogenesis in the sea urchin, synthesis of histones becomes uncoupled from DNA replication. Other papers of interest include communications which probe the mechanisms by which erythropoietin stimulates erythropoiesis and by which lymphocytes respond to various mitogens, and an article which ascribes a possible role for cell-cell interaction during hemopoiesis in the embryonic mouse.

The Cell Cycle in Development and Differentiation is not meant or suited as a textbook but rather is directed at investigators actively working in the field of development. It describes a large number of biological systems that are currently being investigated and exploited. It includes studies which use materials ranging from protozoans to plant shoots, from the naturally synchronous slime mold *Physarum polycephalum* to mammalian fetal liver, and from root meristems to molluscan embryos. Because of the diversity of approaches described in the contributed papers, this book may also interest new investigators searching for biological systems that lend themselves to experimentation and that promise to yield insight into some of the questions raised during the course of the book.

PETER J. STAMBROOK
Department of Embryology,
Carnegie Institution of Washington,
Baltimore, Maryland

Pollution Indicators

Air Pollution and Lichens. B. W. FERRY, M. S. BADDELEY, and D. L. HAWKSWORTH, Ed. University of Toronto Press, Buffalo, N.Y., 1973. x, 390 pp., illus. \$16.50.

Over the last 15 years, the potential use of lichens as biological indicators of air pollution has gradually become widely recognized. Casual suppositions by naturalists during the last century have been supported, then questioned, and finally established through a series of carefully made field and laboratory experiments and observations. This book provides a generally good assessment of the field.

The volume is a mixture of review articles and research papers written by various authors, all but two of whom have done most of their work in the United Kingdom. Although the slant is definitely toward British research (with some chapters specifically on British topics), I believe the book succeeds in presenting a good overall picture. In one chapter or another, almost everything ever published on the subject is listed. Field studies, especially those involving mapping techniques, the effects of SO₂, fluoride, and heavy metal pollution on lichens, and physiological studies all receive close attention. The important introductory and summary chapters are especially well done.

The field approach is thoroughly reviewed by Hawksworth in a chapter on "mapping studies" which covers considerably more than that. Largely on the basis of his own experience in England, the author offers a number of recommendations and guidelines for evaluating pollution levels with the use of lichen vegetation. While I do not agree with all of them, they will undoubtedly be very helpful to those wishing to start a project of their own. A large amount of overlap is encountered in Laundon's fine review of "urban lichen studies," since most urban studies have, in fact, been mapping studies.

Overlap is most serious, however, in the chapters on physiological effects of pollution on lichens. A chapter on general lichen physiology by Farrar follows the presumably more specialized coverage of air pollution and lichen physiology, and precedes separate chapters on SO₂ and photosynthesis and on SO₂ and respiration. Those chapters could well have been combined. A single treatment of the effects of SO₂ on photosynthesis and respiration and

other physiological effects (such as the breakdown of chlorophyll) in conjunction with expanded comments on pertinent aspects of lichen physiology would have permitted more logical comparisons and more integrated conclusions. Pearson's chapter on "air pollution and lichen physiology" adds nothing to the excellent, though brief, chapters on photosynthesis and respiration effects.

The possibility that lichens may disappear in towns as a result of city-induced drought and not pollution receives attention in most chapters, and is the subject of a separate and well-written treatment by Coppins. Certainly urban droughtiness can now no longer be regarded as having anything more than a weak secondary effect on lichen vegetation. Sadly, one of the most convincing sets of evidence, based on transplants (see Guderian and Schönbeck, *Proceedings of the Second International Clean Air Congress*, H. M. Englund and W. T. Beery, Eds., Academic Press, 1971, and references therein) is not cited.

Transplant techniques receive differing treatments by different authors. Farrar dismisses them saying they cannot be adequately controlled; Hawksworth believes they can be useful, but mainly in testing the sensitivity of various species; Baddeley and Ferry state that transplant experiments are extremely valuable and have a great future.

There are a few typographical errors, but they do not detract from an otherwise attractively put together book. Certainly, everyone interested in the monitoring of atmospheric pollution should find himself a copy of this book, and those interested in lichen biology will learn a great deal from it.

IRWIN M. BRODO
National Museums of Canada,
Museum of Natural Sciences, Ottawa

Freshwater Invertebrates

Biology of Hydra. ALLISON L. BURNETT, Ed. Academic Press, New York, 1973. xvi, 466 pp., illus. \$29.

For more than two centuries, the freshwater hydra has served biologists both as an experimental animal and as a subject for classroom study. From the time of its discovery, many biological phenomena were first observed through the study of hydra. For example, in 1701 Leeuwenhoek described in

hydra the first instance of asexual reproduction in animals, and Abraham Trembley (1744) described for the first time successful animal grafting experiments, vital staining of tissues, phototaxis in "eyeless" animals, and thorough proof of budding and regeneration—all with hydra. Today we find hydra widely used throughout the world for investigations of behavioral physiology and cellular ultrastructure and differentiation.

Despite such an illustrious past and contemporary history, there exist but few compendia on hydra. There are the classic *Mémoires* of Trembley (1744) in the original French, as well as in German (1786) and Russian (1927) translations, and Kanaev's (1952) comprehensive monograph in Russian. A modern English volume in the same tradition of excellence has been long overdue. Burnett's book does not fill the bill.

The book contains some reviews, some previously published papers, and some preliminary papers not yet published elsewhere. It is an "in-house" book—all of the articles are either co-authored by the editor or authored by his former graduate or postdoctoral students. Hence, as might be expected, it lacks the rigor as well as the richness and variety in ideas that are normally found in comparable volumes having contributors of diverse educational experience. Instead this book for the most part vigorously promotes the authors' interpretation of growth and differentiation in hydra, an interpretation not shared by most workers in the field.

A number of the contributors treat the work of others with scorn. For example, on Campbell's widely accepted investigations demonstrating the uniform distribution of cell division along the body column (a discovery which negated one of Burnett's major theories), Burnett writes, "This is a false notion and one that must be corrected. . . . It is hoped that this paper will settle once and for all [these] spurious notions" (p. 343).

In the chapter "Ecology" by Reisa, there are numerous deprecatory remarks pertaining to the use of laboratory-grown animals (p. 57), to the role of glutathione in controlling mouth opening (p. 86), and to the observed rapid growth rate of hydra (p. 91). In addition, Reisa brushes off Loomis's careful work on the induction of gonadogenesis with, "It is not the best practice to delay closing a barn door until some of the livestock al-

ready have been lost. Natural selection usually results in an organism 'wiser' than that" (p. 86). This last statement, like most of Reisa's comments, shows a lack of understanding of the work he is criticizing. In fact, his criticism of Loomis (the "father" of modern hydra research) appears to be based solely on a reading of Loomis's *Scientific American* article; he refers to none of Loomis's original scientific papers.

Homespun philosophy and dogma permeate the book. For example, "Teleological devices may have been detected by mechanistic purists. . . . Empathy can be heuristic" (pp. 97-98) and "we maintain that the I-cell [interstitial cell] is here to stay" (p. 267).

Such bursts of rhetoric and defensiveness obviate the editor's introductory statement that "the authors have judiciously [my italics] chosen to cite only those [papers] most pertinent to their [own] contributions" and to discuss some of these fields with heretofore unprecedented "authority" (p. xiii).

Yet the book is interspersed with some interesting ideas on behavior and development, descriptions of tantalizing phenomena that can be studied with hydra (among them cellular differentiation, polarity, and effect of environment on behavior), and some fine electron micrographs. Rushforth's review of hydra behavior is scholarly, but stands alone. It is unfortunate that there is not a chapter on hydra electrophysiology—a subject on which Rushforth is an authority.

Because some of the Burnett group seem determined to scold other hydra workers and to push their own interpretations, they make it difficult for the reader to sift out the fact from the fancy. For that matter, they discourage him from even trying.

HOWARD M. LENHOFF
Department of Developmental and Cell Biology, University of California, Irvine

Books Received

Activités Evoquées et Leur Conditionnement chez l'Homme Normal et en Pathologie Mentale. (Average Evoked Responses and Their Conditioning in Normal Subjects and Psychiatric Patients.) Proceedings of a conference, Tours, France, Sept. 1972. Institut National de la Santé et de la Recherche Médicale, Paris, 1972. xiv, 448 pp., illus. Paper, 50 F.

Advances in Chemical Physics. Vol. 24. I. Prigogine and Stuart A. Rice, Eds. Interscience (Wiley), New York, 1973. x, 358 pp., illus. \$22.50.

Alcoholism. Progress in Research and Treatment. Peter G. Bourne and Ruth Fox, Eds. Academic Press, New York, 1973. xiv, 440 pp., illus. \$21.

Algebra. An Algorithmic Treatment. Kenneth E. Iverson. Addison-Wesley, Menlo Park, Calif., 1973. xiv, 362 pp., illus. Paper, \$8. Addison-Wesley Innovative Series.

Algebraic Number Fields. Gerald J. Janusz. Academic Press, New York, 1973. x, 220 pp. \$18. Pure and Applied Mathematics, vol. 55.

The Amateur Archaeologist's Handbook. Maurice Robbins with Mary B. Irving. Crowell, New York, ed. 2, 1973. xiv, 298 pp., illus. \$7.95.

American Folk Medicine. Clarence Meyer. Crowell, New York, 1973. xvi, 296 pp. \$8.95.

Amphibians. J. F. D. Frazer. Wykeham, London, and Springer-Verlag, New York, 1973. vi, 122 pp., illus. Paper, \$5.80. Wykeham Science Series, vol. 25.

L'Amplification des Signaux Electriques en Médecine et en Biologie (ECG, EEG, Myographie, Rétinographie . . .). J.-P. Guillet. Doin, Paris, 1973. 82 pp., illus. 29 F.

Art and the Future. A History/Prophecy of the Collaboration between Science, Technology and Art. Douglas Davis. Praeger, New York, 1973. 208 pp., illus. \$20.

Atlas of Hand Radiographs. Philip Jacobs. University Park Press, Baltimore, 1973. xii, 246 pp., illus. \$24.50.

Atomic Diffusion in Semiconductors. D. Shaw, Ed. Plenum, New York, 1973. xiv, 608 pp., illus. \$28.

Australia Antigen. Proceedings of a symposium, Philadelphia, Nov. 1971. James E. Prier and Herman Friedman, Eds. University Park Press, Baltimore, 1973. xviii, 236 pp., illus. \$12.50.

Behaviour of Micro-Organisms. Proceedings of a congress, Mexico City, Aug. 1970. A. Pérez-Miravete, Ed. Plenum, New York, 1973. xviii, 302 pp., illus. \$19.50.

Biographical Memoirs. Vol. 43. Published for the National Academy of Sciences by Columbia University Press, New York, 1973. viii, 356 pp. + illus. \$5.

The Biological Efficiency of Protein Production. Proceedings of a symposium, Reading, England, Sept. 1971. J. G. W. Jones, Ed. Cambridge University Press, New York, 1973. xii, 386 pp., illus. \$21.

Biology. The Behavioral View. Roy A. Gallant. Roderick A. Suthers, Ed. Xerox College Publishing, Lexington, Mass., 1973. xvi, 576 pp., illus. \$10.50. Teacher's guide with test items, ii, 92 pp. Paper, \$1.95.

The Biology of the Cervix. Proceedings of a symposium, Lake Wilderness, Wash. Richard J. Blandau and Kamran Moghissi, Eds. University of Chicago Press, Chicago, 1973. xii, 450 pp., illus. + microfiche. \$19.50.

Educability and Group Differences. Arthur R. Jensen. Harper and Row, New York, 1973. viii, 408 pp., illus. \$10.

The Endocrine Function of the Human Testis. Vol. 1. Proceedings of a symposium, Florence, Italy, Apr. and Oct. 1972. V. H. T. James, M. Serio, and L. Martini, Eds. Academic Press, New York, 1973. xii, 590 pp., illus. \$21.50.

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