

succinct encapsulation of its geographical origin, host or vector sources or both, and clues to basic epidemiological and disease potential. For example, the chapters on *Phlebotomus*-transmitted viruses and the Tacaribe group viruses synthesize a diversity of virological and epidemiological facts to give the reader a grasp of the importance of these divergent arbovirus diseases in public health.

The third advantage is the tabulation of antigenically related arboviruses, providing a concise display of relevant features that are the basis for concepts of epidemiological importance. Numerous tables identify type of vector, vertebrate host, evidence of pathogenicity for man, and, in some cases, zoogeographical range. With the fairly detailed indices at the end of the book this makes possible quick location of facts known about a particular arbovirus or group as of 1970, a pursuit which would otherwise require a major bibliographic search.

Because this presentation is not a complete distillation of published literature on arboviruses it does not supplant either the *Catalogue of Arthropod-Borne Viruses* or the thousands of references to be found in other bibliographic resources.

The third major segment of the book deals with what the authors term Certain Specific Problems. This is further subdivided into a treatment of biological problems such as distribution, vectors, vertebrate hosts, and human hosts and then a discussion of particular experiences and interests of the authors in yellow fever and dengue in the Caribbean. The last might have better been presented elsewhere because the material is not particularly relevant to the main focus of the book.

Another evidence that this is a virological treatise rather than one for the clinician is the brevity of the discussion of clinical manifestations in man. The pages devoted to this subject are more over the most confusing in the book and can only frustrate the clinician who seeks helpful information on a suspected arbovirus etiology of illness in a patient. There is an inconsistent mixture of such unfamiliar abbreviations as OHF and AHF with terms such as dengue, yellow fever, encephalitis, and saddle back fever. What relevance epidemics of Rift Valley fever in sheep causing high mortality in lambs and abortion in pregnant ewes have to clinical disease in man is difficult to infer. Perhaps the most useful statement is that "quite simi-

lar disease pictures can be caused by completely unrelated viruses . . . two completely different disease pictures can be caused by strains of virus which are immunologically identical." In short, this volume will not be of much ready use in clinical medicine.

In its intention to deal with "the epidemiology of the more important arboviruses" the book fails most seriously, not because what are presented as the important features in the view of its two authors are not significant, but because it fails to highlight the major issues for scientific contemplation and work by the next generation of investigators and researchers, who must gain some inspiration and guidance from what has already been accomplished by the many workers who are not even mentioned here.

On p. 304 begins chapter 13, "Grouped tick-borne viruses not in group B." This succinctly summarizes Casals's years of work characterizing viruses isolated from ticks, showing antigenic relationships of intriguing geographical associations. Since many of these isolates are from ticks associated with migrating birds and farm-moving animals, they provide substantive data for new concepts of mechanisms for arbovirus movement and distribution. When integrated with findings concerning bird-tick-associated group B arboviruses (Tuleniy) isolated by Lvov off Sakhalin Island and by Clifford and Yunker off the Oregon Coast, hypotheses begin to emerge that relate not only to the global distribution of disease-related arbovirus complexes but to the evolution of genetically different group stem viruses.

Rather than abruptly ending with yellow fever and dengue in the Caribbean it would have been useful to include an outline and interpretation of the medical and public health importance of arboviruses and a discussion of the major unsolved problems for future research. Among the problems that might have been mentioned are: the implications of antigenic cross-reactivity to immunizing agents, oncolytic activity of arboviruses, questions of overwintering of temperate zone arbovirus pathogens, latent infections of vertebrate hosts, the role of migratory birds and other animals in the dispersal and reintroduction of arboviruses, antigenic modification and mutation, evolution of antigenic types, and multiple vector types.

Recalling that the National Founda-

tion for Infantile Paralysis subsidized publication of the first two editions of Rivers's *Viral and Rickettsial Infections of Man*, which stimulated the interest of, educated, or at least had a significant influence on today's mature working virologists, one regrets that the Rockefeller Foundation, which already has invested \$30 million in this arbovirus research program, did not add a bit more to bring this book within easier financial reach of another generation of students and scientists. Being the classic in its field, it should be owned and used by a much larger number of persons and institutions all over the world than its price will allow.

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## Embryonic Cells

**The Cell Cycle in Development and Differentiation.** Proceedings of a symposium, Bristol, England, July 1972. M. BALLS and F. S. BILLETT, Eds. Cambridge University Press, New York, 1973. xii, 484 pp., illus. \$32.50. British Society for Developmental Biology Symposium.

The task undertaken by this book of trying to relate events at the level of the cell cycle to processes of differentiation and development is a very difficult one. The difficulty lies in our complete lack of understanding of how the cell cycle itself is regulated, let alone of how it may participate in the complex processes of development. In the opening chapter, Mitchison briefly surveys some of the known events and characteristics of the cell cycle and describes two current theories that have been proposed to explain the periodicities associated with the cell cycle. His comments are both provocative and stimulating, but reinforce our awareness of how little we know regarding mechanisms which regulate the cell cycle. Compounding the usual problems that accompany too little understanding are the numerous hazards encountered when one measures the cell cycle and its component parts ( $G_1$ , S,  $G_2$ , and mitosis). These hazards are enumerated and discussed by Steel in the succeeding chapter, which is particularly valuable for workers measuring cell cycle parameters in cell populations in vivo.

As one might expect from 26 separate contributions, the papers that follow vary greatly in perception and

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.

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## 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 SO<sub>2</sub>, 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 SO<sub>2</sub> and photosynthesis and on SO<sub>2</sub> and respiration. Those chapters could well have been combined. A single treatment of the effects of SO<sub>2</sub> 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.

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## 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