Book Reviews

Control of Pandemic Influenza

Influenza. Virus, Vaccines, and Strategy. Proceedings of a meeting, Rougemont, Jan. 1976. PHILIP SELBY, Ed. Published for Sandoz Institute for Health and Socio-Economic Studies by Academic Press, New York, 1976. 354 pp., illus. Paper, $19.75. Sandoz Institute Publication No. 5.

Influenza. The Viruses and the Disease. CHARLES H. STUART-HARRIS and GEOFFREY C. SCHILD. Publishing Sciences Group, Littleton, Mass., 1976. x, 242 pp., illus. $22.

These two books on influenza, quite different in design and emphasis, appeared just as the United States public health establishment was going through the trials and tribulations of the "swine flu" immunization program. In fact, brief chapters on that subject were added to both books as timely afterthoughts.

The volume edited by Philip Selby records the proceedings of an international working group on pandemic influenza. It stresses the methods and results of global influenza surveillance, prevention, control, and chemotherapy and the socioeconomic aspects of the public health problems posed by the pandemic character of influenza.

The entire fabric of surveillance and prevention is based on the premise that control of pandemic influenza can eventually be achieved by monitoring major changes (antigenic shifts) in one or both of the surface glycoproteins of the causative virus. These two moieties are assembled into two distinct projections associated with the lipid bilayer envelope of the virus particle. One carries the hemagglutinating (H), the other the neuraminidase (N) activity of the virus. From time to time, the H or N polypeptide of a prevailing type A influenza strain is replaced by a new one to which the human population is not immune. It is then that there is a threat of a new pandemic sweep. Both glycoproteins can be readily purified as monovalent test antigens. Antibodies against H neutralize and are protective, those against N retard viral release from infected cells and thus provide partial protection against the spread of infection. It is therefore thought feasible to prepare vaccines (containing either whole inactivated or live attenuated virus or H and N subunits) against a newly emerging antigenic strain before it has a chance to spread pandemically.

New strains are believed to arise by recombination, which is greatly facilitated by the fact that the viral genome is made up of eight independently replicating RNA segments, each coding for one nonstructural or structural viral protein. In a cell infected with two distinct strains of influenza A, new genomes arise by random reassortment of these segments. Thus it is possible to tailor-make hybrid viruses for vaccine production that contain the desired surface glycoproteins and, ideally, the characteristics that are expected to be associated with low virulence. The methodology of these procedures, the different forms of vaccine and their evaluation, and the prospects of new developments are all comprehensively discussed in the Selby book. There are also discussions of the cost of influenza as well as the social and psychological problems related to the acceptance or nonacceptance of vaccine preparations. The numerous chapters dealing with these practical aspects are singularly useful, though somewhat repetitious.

In addition, the book provides a brief chapter on viral structure and replication (by John Skehel) and a particularly provocative summary of what is known and not known about the pathogenesis of human influenza (by C. A. Mims). Despite their brevity, these two chapters, taken together as the essential backdrop to the main portions of the book, serve an important purpose: they remind the reader (i) that there are at least six genome segments other than those coding for H and N, some of which may play a critical role in the disease-producing capacity of the virus; (ii) that virtually nothing is known about cellular immunity and immunopathological mechanisms in influenza, which may conceivably involve type-specific rather than strain-specific antigens, that is, the M (matrix) protein or the capsid protein; and (iii) that invasion of the bloodstream and distant organ systems by virus or viral gene products spilling over from infected cells of the respiratory tract has received only scant investigation. The answers to the unresolved questions about these and other fundamental processes may yet prove to compromise the notion that the mere induction of some levels of anti-H or anti-N antibodies or both in the serum assures protection against all potential disease manifestations. There are precedents for unforeseen complications in other immunizations involving inactivated viruses (measles and respiratory syncytial virus) and in natural disease states caused by multiple antigenic strains of one virus (dengue hemorrhagic fever and shock syndrome).

Read with awareness of these potential pitfalls, the book edited by Selby offers an excellent résumé of the current state of knowledge and practices in an important branch of preventive medicine.

The book by Stuart-Harris and Schild is broader in its approach. It is a fairly comprehensive treatment of all aspects of influenza and its viruses. There is some advantage to the writing of such a book by only two authors. In this case the result is cohesiveness of style and emphasis and avoidance of excessive redundancy. The book is less encyclopedic than an earlier many-author one edited by Edwin D. Kilbourne (*The Influenza Viruses and Influenza*, Academic Press, 1975), but it provides a fine and readable introduction to the subject, laced with historical perspective and up-to-date bibliographic references.

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Retinal Structure and Function

Neural Principles in Vision. Papers from a symposium, Munich, Sept. 1975. F. ZETTLER and R. WEILER, Eds. Springer-Verlag, New York, 1976. x, 432 pp., illus. $39.40. Proceedings in the Life Sciences.

This book of proceedings deals with recent advances in our understanding of visual function, primarily at the retinal level, in various vertebrate, arthropod, and molluscan species. The 22 chapters are generally comprehensive and up to date, and the quality of light and electron micrograph reproduction is good to excellent.

The most pervasive issue considered is whether, by knowing the geometry of the neuron, one can reliably infer its functional properties. In the section on vertebrates, lengthy contributions by Wagner, Gallego, and Scholes describe

how, for a given retina, the subtypes of neurons are readily distinguished on the basis of dendritic and axonal arborizations, which in turn determine the pattern of synaptic connections made by the cell. Naka, however, on the basis of an extensive structural and functional study of single neurons in the catfish retina, demonstrates that the three-dimensional distribution of a cell's processes is not always an unambiguous indicator of its response properties. As Kaneko and Shimazaki find in their study of bipolar and horizontal cell responses in carp retina, the conductance changes effected at a particular synapse are more appropriately related to morphology on an ultrastructural, or even molecular, level than to the distribution of cell processes in space. McReynolds raises comparable issues in a lively review of the ionic basis of receptor responses in several molluscan and protochordate species. Whether membrane or synaptic ultrastructure will provide a clue to the nature of the conductance channel or the polarity of the synapse remains to be seen.

Strausfeld and Wehner present comprehensive and esthetically pleasing reviews of neuronal geometry in various insect visual systems. In the second layer of the visual pathway, Golgi impregnation and electron microscope studies reveal numerous subtypes of interneurons and centrifugal neurons, each with a highly specific geometry and set of synaptic connections. Laughlin and Zettler and Weiler describe spatial integration and lateral inhibition phenomena that occur in some of these cells and that underlie contrast detection and visual adaptation. However, insufficient functional data are available as yet to make it possible to assign a particular integrative role to each class of neuron that is described morphologically. In this regard, the book as a whole convinces one of the many important differences in visual neuron morphology in both closely related and distantly related species; hence the importance of pursuing structural and functional studies on a single organism.

One beautiful correlation between form and function is provided by Wehner's description of polarized light perception in hymenopterans. Their ommatidia are of the fused rhabdom type in which nine retinular cells of different spectral classes contribute microvilli to a central light-sensitive structure, the rhabdomere. The different optimal directions for polarization sensitivity among the retinular cells, the length of the cells, the electrical coupling between neighboring cells, and the twisting of the rhabdom in its central course all serve to reduce the possibility of polarized light detection. One short, ultraviolet-sensitive retinular cell fulfills this function, however, and the fact that some rhabdoms twist clockwise and others counterclockwise provides the bee with two polarization analyzers of different optimal orientations.

This collection of essays is provocative and timely, but it will not be easy reading for those not familiar with visual system organization. Each essay is a review of a small area of current research, and, for that reason, the book would have been well served by a final chapter that reconsidered the question that motivated the symposium—whether a close examination of the visual systems of diverse animals yields generally applicable principles of neural organization. Even without such a chapter, there is much of interest for the patient reader.

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Marine Organisms

Calcareous Algae. JOHN L. WRAY. Elsevier, New York, 1977. xiv, 186 pp., illus. $28.75. Developments in Palaeontology and Stratigraphy, 4.

With the increasing interest in the study of ecosystems, it has become apparent to most benthic marine scientists that algae, calcified and not, are the key to shallow-water carbonate environments. While there is a fairly voluminous literature, extending over the past century, that treats calcareous algae, most of it was developed by biologists and geologists with little appreciation for the ecological and physiological relationships of the organisms with which they were dealing. A resulting failure to recognize ecological variation and to appreciate biological and physiological factors, coupled with a lax approach to taxonomy, produced a quagmire of literature that extended up to the 1960's. Consequently, many workers with Recent and fossil marine environments have been content to be blind to even the existence of some of these algae.

John Wray's book is a very timely summary of an often obscure field and its literature. It has been written for geologists, paleontologists, and sedimentologists and is obviously intended as an introduction to the field. I personally would have preferred a more thorough treatment, especially one including more of the biological-ecological literature that has been developed during the past decade. Phenomena of calcification, grazing, and microenvironment in modern carbonate systems are critical for paleoecology, and students as well as more classical paleontologists should be made aware of them.

Wray has been careful to point out a stumbling block for biologists and paleontologists who have approached calcareous algae in the past several decades: dimensional data and species identification should be approached with great caution and greater understanding of phycology than one derives from invertebrate courses and a quick swim through the literature.

On the other hand, the book is weaker than I would regard as desirable on the basic cytological level. Also, systematics is not adequately presented. For example, the statement that the taxonomy of the major genera of crustose corallines has changed but little is fortunately true—that is why we have a Rules of Nomenclature. However, there is little relationship between modern coralline systematics (and the biology on which it is based) and that of the 19th century (or even the 1940's). Unfortunately, many biologists and paleontologists are still producing identifications in the 19th-century mode that are virtually useless for modern ecology. Many genera are also omitted on the grounds that the anatomic or reproductive characters needed do not appear in fossils. That would not be a problem if all workers would recognize that a specimen identified as *Lithothamnium*, for example, might really belong to any of several genera. Paleoecological conclusions based on such an identification could be greatly in error.

These are not intended as strong criticisms at all. I am sure the author recognizes these problems and has reflected at length over the level of presentation. For the paleontologist and stratigrapher seeking to recognize fossil algae and to have some feeling for what they mean paleoecologically, the treatment is excellent, and it will help him through the literature. For the paleontologist, biologist, or ecologist who would work at some length with calcareous algae, this book is a good introduction.

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