

## Cytocidal Viruses

**Mechanisms of Virus Infection.** Wilson Smith, Ed. Academic Press, New York, 1963. x + 368 pp. Illus. \$12.

The study of viruses and their interactions with cells is one of the very active and exciting fields of modern biology. Recent conceptual and technological advances in molecular biology have opened up many new approaches to a better understanding of the structure, biosynthesis, and genetics of viruses. New information is accumulating rapidly in these areas. However, analysis of the more complex problem of virus pathogenicity has not yet progressed much beyond the descriptive phase. Viruses kill the cells that they infect, or they may cause transformation of susceptible cells to tumor cells. The precise mechanisms whereby they bring about these effects are not known.

This new book, *Mechanisms of Virus Infection*, aims to present a picture of the various aspects of virus-cell interaction, including transmission within, as well as among, host organisms. Although the book carries a general title and uses a broad approach, it deals almost exclusively with those viruses that cause degeneration and death of the host cell—that is the cytocidal viruses. The reason for this restriction is not clear, for the study of tumor viruses is yielding much exciting new information on virus infection.

The book opens with a chapter entitled "General considerations." Wilson Smith properly emphasizes the wide variety of viral agents known to exist and cautions against premature generalizations based on the study of only one group of viruses. It should be pointed out that Smith's remarks apply most directly to the effects of viruses on cells rather than to the biochemical mechanism of virus synthesis. In the area of animal virus biosynthesis, much has already been gained from attempts at extrapolation from bacteriophage research. Many of the fundamental concepts concerned with virus infection are aptly summarized in this introductory chapter, but in view of the rapid progress in the field of nucleic acid research, some incorrect statements are unavoidable. For example, it is stated that RNA molecules always consist of a single strand, yet evidence is now available that the RNA in certain viruses is double-stranded. And it is now known that viruses direct the synthesis of a number of new enzymes in

## Book Reviews

### Mathematics Today, the Dartmouth Conference

**New Directions in Mathematics.** A conference, arranged by John G. Kemeny and Robin Robinson, and held at Dartmouth College in November 1961. Robert W. Ritchie, Ed. Prentice-Hall, Englewood Cliffs, N.J., 1963. iv + 124 pp. Illus. \$6.60.

A conference entitled *New Directions in Mathematics* was held at Dartmouth College in November 1961, in connection with the dedication of Dartmouth's new mathematics building. A significant number of leading mathematicians took part in the program, and this small book is a detailed report of the prepared addresses and the informal discussions that followed.

I know of no book or article available anywhere at the present time which more clearly pictures the nature of mathematics today, the outside influences on the subject, the direction in which mathematics may be going, or the concern of those working in the field for its development. Moreover, the reader receives, as an added bonus, clear insight into the type of men who represent the mathematical world today. I doubt whether the overall view of the field, offered by this book, will be sure to "influence the future of mathematics," as the publishers claim, but I do feel that *New Directions in Mathematics* is a worthwhile contribution to the literature.

The conference, and thus the book, was divided into four parts: *New Directions in Secondary School Mathematics*, *College Mathematics*, *Applied Mathematics*, and *Pure Mathematics*.

The three participants in the discussion of secondary school mathematics, Leon Henkin (University of California), E. E. Moise (Harvard University), and W. E. Slesnick (formerly of St. Paul's School, and now Dartmouth College), considered such topics as the degree of specialization of mathematics, the use of teaching (or learning?) ma-

chines, traditionalism, the advancing frontier of research, the new applications of mathematics to other fields, the curriculum, and the pedagogy and methodology of teaching. In addition, there is a rather detailed and excellent outline of the "basic curriculum" for the first 11 years of school, as well as several possible specific suggestions for the senior year.

In discussing college mathematics R. C. Buck (University of Wisconsin), H. O. Pollak (Bell Laboratories), and J. L. Snell (Dartmouth College) predicted more interaction of separate fields of mathematics, such as algebra and topology, in the field of analysis; significant use of computers in all education, technical as well as cultural, and the inevitability of more special honortype courses. They also considered the amount of specialization in contrast with basic and broad liberal-arts training.

Mark Kac (Rockefeller Institute), Pollak, and A. W. Tucker (Princeton University) discussed applied mathematics. By specific examples, applied mathematics is "defined." Not only are the natural sciences considered but also the social sciences. Problems in these fields have led to entirely new branches of mathematics, such as game theory, linear programming, information theory, Boolean algebra, and Markov processes. In applied mathematics specialization is necessary, but interest in more than one branch of mathematics is frequently very important. Irving Kaplansky (University of Chicago) and Peter Lax (New York University) discussed pure mathematics. They briefly mentioned recent exciting results in the field of algebra and abstract analysis, some unsolved problems with solutions predicted, and new methods of approach in mathematical research.

E. P. VANCE

*Department of Mathematics,  
Oberlin College*

the infected cell, instead of relying on "borrowed" cell enzymes for replication.

Following the lucid chapter, "The bacteriophage model," by William Hayes, there is a systematic and comprehensive chapter, by A. W. Downie, entitled "Pathways of virus infection." The routes by which a virus enters into the host body, spreads within the host, and is released from the host are reviewed. There follows a series of three chapters on mechanisms of cell infection. In the first chapter, "Virus attachment and penetration," by A. Cohen, the complexity underlying the seemingly simple phenomenon of virus adsorption is clearly brought out. The discussion of penetration would have been considerably more advanced if Cohen had been able to use more of the information published in 1961 and later. Alick Isaacs' chapter, "Intracellular virus replication," provides a picture of the biochemical events in virus reproduction. Considerable evidence is presented indicating that the formation of viral nucleic acid and the formation of viral proteins are separate events. D. A. J. Tyrrell's chapter, "Virus release," covers, in a general way, not only the release phenomenon itself but also viral growth curves, the intracellular localization of virus multiplication, and the techniques used to study viral growth and release. Mention is made of some of the findings with certain tumor viruses.

In the chapter "Virus pathogenicity," J. C. N. Westwood brings together much of the pertinent information that bears on the pathogenesis of poliomyelitis and poxvirus infections. The section on virus toxicity emphasizes the important fact that an incomplete or abortive cycle of multiplication may result in the degeneration and death of host cells without the production of infective virus. Such incomplete cycles have been observed in a variety of experimental systems. However, as Westwood points out, disease develops in a host organism only if there is successive involvement of an increasing number of cells, which depends on the production of infective virus.

The concluding chapter, by B. Belyavin, is entitled "Virus adaptability and host resistance." The ability of a virus to negotiate both intrahost and interhost pathways is taken as a measure of its "adaptation." Resistance of the host system is defined in terms of the sum total of the barriers that must be overcome. A thoughtful discussion

of virus-host equilibria is presented. The final section is on the fascinating subject of antigenic variation among influenza viruses. There is a fairly detailed discussion of the possible epidemiological significance of the so-called "Q-phase" variants which are characterized by low sensitivity to antibody, but the nature of the variants is not indicated. No reference is made to the important fact that the so-called "phase variation" is due to fluctuation from strain to strain in the proportions of two kinds of genetically distinct virus particles, which differ in their sensitivity to antibody and inhibitors.

I received the review copy of this volume in October 1963. [The review copy was received from the publisher on 26 September. Ed.] A glance at the bibliography reveals that there are few references to papers published in 1961 and only rare ones to papers published in 1962. This raises the question as to whether any chapter on a subject in which progress is extraordinarily rapid can be up to date in such a book as this. The most rapidly moving fields are perhaps best summarized in individual review articles or in promptly published symposium papers. Another shortcoming of the present volume is that it contains little information about tumor viruses.

This book does present a well-balanced view of cytotoxic virus infections. There is no doubt that it will be read with interest and profit by many virologists as well as by scholars and experts in other fields. Students of medicine and physicians should find that it provides a broad understanding of many of the fundamental aspects of virus-cell interaction.

IGOR TAMM

Rockefeller Institute,  
New York, New York

## Salmon Politics

**Politics and Conservation: The Decline of the Alaska Salmon.** Richard A. Cooley. Harper and Row, New York, 1963. xxii + 230 pp. Illus. \$5.

The commercial salmon pack in Alaska reached important proportions shortly after the turn of this century and following a quick buildup, became the major Alaskan industry for the next 50 years. Despite its prominence as a resource, and despite the recurrent waves of conservation enthusiasm that

engulfed this country from time to time, it proved impossible for the government of the United States effectively to regulate the fishery. According to the author of this book, the salmon runs of Alaska have been essentially destroyed by overfishing. His book is a meticulously documented history of the demise of the fishery and of the politics that underlay the inadequate regulatory processes.

For 10 years the author, Richard A. Cooley, has lived in Juneau, where he serves as director of the Alaska Natural Resources Center, operated by the Conservation Foundation. He is obviously a scholar, well-versed in the skills of sifting the historical documents available in the capital city. He traces the development of the federal conservation program through written records "... found in Congressional hearings, committee reports, the *Congressional Record*, official reports of government agencies, enacted laws and policy statements, newspapers and trade journals, and the writings, addresses, letters and reports of persons and organizations involved in the policy-formulating process." Recounting the play-by-play sequence of salmon politics, Cooley skillfully leads the reader through an account of the long sordid history of repeated frustration of conservation efforts by a strong well-organized lobby of packers, working in conjunction with a weak and sometimes disorganized federal administration. In so doing, the author clearly expresses his own prejudices and feelings toward individuals or groups that he considers culpable. But basically he brings out a more significant point, namely, that in a free and competitive fishery, the ordinary democratic processes of regulation by limiting seasons and gear cannot adequately protect a vulnerable breeding stock. "Whatever the individual canner spared for spawning purposes, his competitors would thankfully accept and place in cans." In this pattern of ruthless competition, the fishing interests unremittably kept canning salmon until they had destroyed their own livelihood.

Administration of the salmon fishery—such as remained of it—passed from federal jurisdiction to the State of Alaska in 1959. In the introduction to this book, Senator Ernest Gruening castigates the past federal administration and implies that things will be better under statehood. The author, however, takes a more cautious view. In his terminal chapter he reviews the