ruses. In general, the biology of the various virus systems is somewhat less well developed than the chemistry (representing perhaps part of the 5-percent personal bias in the choice of literature quoted that the author acknowledges in his preface). It is difficult, for example, to understand how the development of molecular virology was more enhanced by the crystallization of poliomyelitis virus (table 1.1) than by the earlier (and unmentioned) discovery that this virus can be replicated in cell culture, an observation by Enders and his colleagues that really opened the door for the development of the science of virology. The one page reserved for the replication of DNA-containing animal viruses also would have benefited from expansion of the information presented.

Throughout the book the diagrammatic presentations are excellent and greatly simplify the complex problems and theories presented. The electron micrographs and charts have also been well selected to demonstrate the points made.

This book should prove useful to undergraduate students and to those who are especially interested in general information about plant and bacterial viruses. It is less valuable for those in other fields interested in information about animal viruses, but those working with these viruses would be well advised to read the book to enhance their own perspective.

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Photochemical Reactions

Energy Transfer and Organic Photochemistry. A. A. LAMOLA and N. J. TURRO. With chapters by P. A. Leermakers and T. R. Evans. Interscience (Wiley), New York, 1969. xii, 388 pp., illus. $18.50. Technique of Organic Chemistry, vol. 14.

Our understanding of the photochemical transformations of organic molecules has increased tremendously in both scope and sophistication during the last decade. This rapid advance was made possible by the development of a powerful method for analyzing photochemical reaction mechanisms. The method, which is largely the creation of G. S. Hammond and his co-workers, involves a judicious blending of solution kinetics, spectroscopic techniques, and chemical intuition and has the considerable advantage of not requiring elaborate apparatus. Its key feature is the exploitation of triplet (and sometimes singlet) excitation transfer in solution as a powerful probe for determination of the number and spin multiplicity of excited-state intermediates in a photochemical system. With this information available, a knowledge of the probable nature of these excited states —obtained from theoretical or perhaps spectroscopic studies—permits shrewd guesses to be made about the primary photochemistry to be observed for particular systems. Using this approach, organic photochemists have discovered large numbers of new photochemical reactions, and have succeeded in dispelling much of the mystery surrounding previously discovered processes such as photosensitized oxygenation reactions. Many important problems concerning, among other things, chemiluminescence, certain biological phenomena affected by light, photodegradation of materials, and lasers have been attacked profitably with this method. The growth of organic photochemistry has had considerable impact on the development of spectroscopy, the development by Lamola and Hammond of a convenient method for measurement of intersystem crossing yields being only one of many important contributions.

This volume, the latest in the Weissberger series on physical methods in organic chemistry, is about modern methods for determining photochemical reaction mechanisms. The heart of the book is two elegant articles illustrating principles and practice in determination of photochemical reaction mechanisms. Lamola gives a pellucid treatment of the transfer of electronic excitation in fluid media and its relationship to determination of photochemical mechanisms. A crisp and refreshingly clear presentation of theoretical and experimental spectroscopic preliminaries is followed by the most important part of the presentation for the organic chemist: a fairly complete exposition of applications of electronic energy transfer to the spectroscopy and photochemistry of organic molecules. In the following chapter, Turro gives a chromophore-by-chromophore account of the photochemical transformation of organic molecules. An attractive feature of his article is the mode of presentation. For each chromophore, the expected nature of the electronically excited states is discussed and then related to observed photochemical reactions. In combination, these articles provide the best text available today for learning about modern methods for elucidation of photochemical reaction mechanisms.

Only two real criticisms of this book may be made. The first is that it was published two years after completion of the literature surveys. Interscience should do better. The second is that there are some techniques for mechanistic investigations—such as matrix isolation of highly reactive primary photochemical products—that receive less mention than they deserve.

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A Ciliate

The Anatomy of Paramecium aurelia. A. JURAND and G. G. SELMAN. Macmillan, London, and St. Martin's, New York, 1969. xiv, 218 pp., illus. $18.

Jurand and Selman have presented the community of protozoologists with an excellent comprehensive account of the morphology of *Paramecium aurelia*. Their book gives a detailed, illustrated description of the ultrastructure of this ciliate. Its pages contain a narrative on the structure of *Paramecium*, excellent diagrams, and electron micrographs of great esthetic and scientific value.

Discussed in detail are the ultrastructure of the pellicle and its associated organelles, the gullet (buccal apparatus), food vacuoles, contractile vacuoles, the cytoplasm and its organelles, the nuclei, binary fission, conjugation, and the cytoplasmic symbiotic inclusions. Some of the plates accompanying these sections are superb, especially plate 52 (first published in the *Journal of General Microbiology*), which shows the extraordinary sophistication of the endosymbiote particle lambda.

It comes somewhat as a surprise that no electron microscopic studies have been made of autogamy. This process is fleetingly described on page 3, and it is stated there that the nuclear changes are the same as those associated with sexual reproduction. This may be so, but autogamy is an important aspect of the life cycle of *P. aurelia* and deserves more attention than it is given by the authors.

Jurand and Selman cautiously approach the problems inherent in electron microscopy. They warn of the pitfalls and the disastrous results of