

exact state of the chromosomes that remain after many cell generations. Thus, as we have discussed elsewhere (F. M. Davis and E. A. Adelberg, *Bacteriol. Rev.* **73**, 197 [1973]), experiments on the expression of tissue-specific genes in hybrids have not as yet thrown much light on the mechanisms of differentiation. On the other hand, the ability to make clonal hybrids has opened up the highly successful field of gene mapping—exemplified in this volume by Ruddle's review.

The title of this book is misleading. With the exception of one short paper, there is nothing in the book about hybridization. Rather, it is about the applications of hybrids to the solutions of certain problems. Unfortunately, the number of problems that have been so illuminated is small. Readers of this book will learn a little about the control of the cell cycle and about nuclear inactivation in chick erythrocytes. They will discover that fusion hybrids are useful for revealing the presence of latent viruses and for turning on genes that are normally not expressed (such as the gene for complement C4 in HeLa cells). They will certainly discover the utility of hybrids for gene mapping, particularly in the human genome. Mostly, however, they will find a wealth of data that pertain only to the artificial systems that fusion hybrids represent and seem to me to have little significance for the normal cell phenomena they were designed to investigate.

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Organic Substances

The Total Synthesis of Natural Products. JOHN APSIMON, Ed. Wiley-Interscience, New York, 1973. Vol. 1, xii, 604 pp., illus. \$24.95. Vol. 2, xii, 754 pp., illus. \$22.50.

These two volumes (a third is in the offing) through flow charts and text present accounts of total syntheses of natural products that have been devised by chemists mainly during the past 40 years. The classes of natural products that have been selected for inclusion are the more important ones, as the voluminous literature citations that follow each review indicate. Volume 1 deals with syntheses of carbohydrates, prostaglandins, pyrrole pigments, nucleic acids, antibiotics, and oxygen ring

compounds. Volume 2 features a more structurally homogeneous format and covers monoterpenes, sesquiterpenes, triterpenes, and aromatic steroids. Volume 3 will include diterpenes and alkaloids. A review of nonaromatic steroid synthesis might also be appropriate for the sake of completeness, although the 1970 review by Akhrem and Titov covers the topic thoroughly.

For the most part the series has been carefully edited. The formulas, an all-important part of synthesis reviews of this sort, have been clearly and carefully drawn. The authors have thoroughly covered the literature, and some have even included unpublished work in their reviews. The flow charts would be considerably more useful if reagents and yields were indicated for the majority of synthetic steps. Some authors show reagents and some note yields, but in no case are both consistently presented. In view of the recent and welcome proliferation of synthetic methodology, the efficiency of a given transformation needs to be considered in an evaluation of the synthesis. Thus reported yields must assume increasing importance in reviews of this type.

When complete this series should constitute the most up-to-date and comprehensive source book on natural product synthesis. It will be of great utility to those practicing or studying the art of synthesis, master and tyro alike. For most topics the flow charts alone can give the reader ideas regarding possible solutions for synthetic problems the reader may be confronted with in his own research. Therein lies much of the value of a series of this nature.

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