

# The Total Synthesis of Natural Products

VOLUME 1

*Edited by*

JOHN ApSimon

*Department of Chemistry  
Carleton University, Ottawa*

WILEY-INTERSCIENCE, a Division of John Wiley & Sons, Inc.

New York • London • Sydney • Toronto



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# Contributors to Volume 1

U. Axen, Upjohn Company, Kalamazoo, Michigan  
F. M. Dean, University of Liverpool, England  
A. H. Jackson, University College, Cardiff, United Kingdom  
F. Johnson, Dow Chemical Company, Wayland, Massachusetts  
J. K. N. Jones, Queen's University, Kingston, Ontario  
S. A. Narang, National Research Council of Canada, Ottawa  
J. E. Pike, Upjohn Company, Kalamazoo, Michigan  
W. P. Schneider, Upjohn Company, Kalamazoo, Michigan  
K. M. Smith, University of Liverpool, England  
W. A. Szarek, Queen's University, Kingston, Ontario  
R. H. Wightman, Carleton University, Ottawa, Ontario



# Preface

Throughout the history of organic chemistry we find that the study of natural products frequently has provided the impetus for great advances. This is certainly true in total synthesis, where the desire to construct intricate and complex molecules has led to the demonstration of the organic chemist's utmost ingenuity in the design of routes using established reactions or in the production of new methods in order to achieve a specific transformation.

These volumes draw together the reported total syntheses of various groups of natural products with commentary on the strategy involved with particular emphasis on any stereochemical control. No such compilation exists at present and we hope that these books will act as a definitive source book of the successful synthetic approaches reported to date. As such it will find use not only with the synthetic organic chemist but also perhaps with the organic chemist in general and the biochemist in his specific area of interest.

One of the most promising areas for the future development of organic chemistry is synthesis. The lessons learned from the synthetic challenges presented by various natural products can serve as a basis for this ever-developing area. It is hoped that this series will act as an inspiration for future challenges and outline the development of thought and concept in the area of organic synthesis.

The project started modestly with an experiment in literature searching by a group of graduate students about six years ago. Each student prepared a summary in equation form of the reported total syntheses of various groups of natural products. It was my intention to collate this material and possibly publish it. During a sabbatical leave in Strasbourg in the year 1968–1969, I attempted to prepare a manuscript, but it soon became apparent that if I was to also enjoy other benefits of a sabbatical leave, the task would take many years. Several colleagues suggested that the value of such a collection

would be enhanced by commentary. The only way to encompass the amount of data collected and the inclusion of some words was to persuade experts in the various areas to contribute. I am grateful to all the authors for their efforts in producing stimulating and definitive accounts of the total syntheses described to date in their particular areas. I would like to thank those students who enthusiastically accepted my suggestion several years ago and produced valuable collections of reported syntheses. They are Dr. Bill Court, Dr. Ferial Haque, Dr. Norman Hunter, Dr. Russ King, Dr. Jack Rosenfeld, Dr. Bill Wilson, Mr. Douglas Heggart, Mr. George Holland, and Mr. Don Todd. I also thank Professor Guy Ourisson for his hospitality during the seminal phases of this venture.

JOHN APSIMON

*Ottawa, Canada*

*February 1972*

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**THE TOTAL SYNTHESIS  
OF NATURAL PRODUCTS**



# The Total Synthesis of Carbohydrates

J. K. N. JONES AND W. A. SZAREK

*Department of Chemistry, Queen's University, Kingston, Ontario, Canada*

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## 1. INTRODUCTION

The carbohydrates comprise one of the major classes of naturally occurring organic compounds. Although the structures of carbohydrates appear to be quite complex, the chemistry of these compounds usually involves only two kinds of functional group, ketone or aldehyde carbonyls and hydroxyl groups. The carbonyl groups normally are not free but are combined with