

Essentials of **Modern Organic Chemistry**

WILLIAM A. BONNER

ALBERT J. CASTRO

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MODERN CHEMISTRY

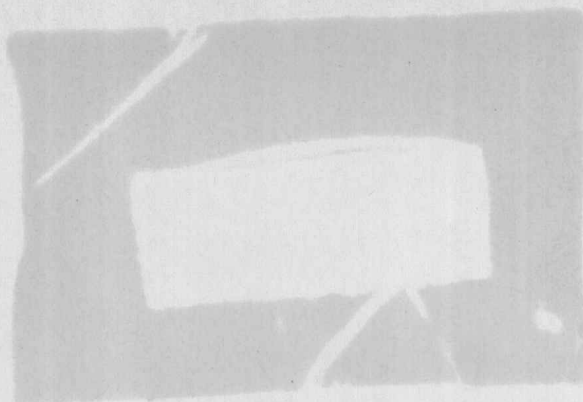
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ESSENTIALS OF MODERN
ORGANIC CHEMISTRY

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CONSULTING EDITORS' STATEMENT

MODERN organic chemistry is constructed upon a well-developed intellectual framework of compelling beauty and fascination. The science of organic chemistry has come of age. No longer is the subject an impenetrable jungle of unrelated facts, but rather a stately mansion soundly built upon comprehensive unifying concepts and sweeping interlocking ideas.

In recent years the architecture of organic chemistry has been so clearly and consistently established that no longer should the student be denied the opportunity to view the subject as an exciting intellectual achievement. The time has come, we believe, when he, too, *can* and *should* be taught to explore the grand edifice of organic chemistry as a challenging adventure of the mind. This is precisely the contribution which the authors of *Essentials of Modern Organic Chemistry* are making. We at Reinhold are honored to present this text, because we believe that its special contribution heralds a notable advance in teaching and learning for the terminal course in organic chemistry.

Professors Bonner and Castro hold distinguished records as master teachers and active research workers in organic chemistry, one at a noted private university, the other at an outstanding state college. Out of their broad experience, they have become convinced that the student of organic chemistry can best be taught the subject on a broad, conceptual basis. More than that, they have found that such an approach adds exhilaration and stimulus to active participation in the learning adventure.

Teachers and students, alike, who enjoy the use of *Essentials of Modern Organic Chemistry* will, we are confident, prove that they are right.

CALVIN A. VANDERWERF
HARRY H. SISLER

ESSENTIALS OF ORGANIC

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To Our Wives

Preface

RECENT important and exciting developments in organic chemistry have led us to feel the need for a modern and challenging textbook. Furthermore, as we encounter students with a better foundation in basic chemistry, we feel that a rigorous, updated treatment of organic chemistry should prove vital and stimulating. We believe that today's beginning student is equipped both to grasp the modern theoretical concepts underlying organic chemistry and to appreciate recent technical advances in the subject. Accordingly, we have emphasized principles, mechanisms, and modern techniques throughout the text, and have left a good portion of the traditional factual matter for learning later if needed.

Certain distinguishing features of the present text merit comment. It is written with the view that all students enrolled in the lecture course may not take the accompanying laboratory. Accordingly, early chapters are devoted to isolation and purification procedures (including vapor phase and thin layer chromatography) and to characterization techniques (including mass, nuclear magnetic resonance, infrared, and ultraviolet spectrometry). Those not enrolled in laboratory work thereby gain an appreciation for the important methods of organic chemistry, and the laboratory student is aided as well. Aliphatic and aromatic compounds are integrated, resulting in an economy of presentation and permitting the early introduction of the latter class of compounds in accompanying laboratory work. A brief introduction to mechanisms of organic reactions and other theoretical features is presented early in the text. These concepts are then used as a framework that is employed throughout the text and expanded at proper points. Natural products, medicinal substances, and other important types of compounds representative of particular structures are interwoven throughout the text, and a separate chapter is devoted to carbohydrates, amino acids, proteins, and other natural products.

In deciding upon the reactions to be included, two criteria have been

employed: (1) Does the reaction illustrate a basic principle or concept? (2) Is the reaction of practical value in the laboratory or in commerce? Thus many of the traditional reactions treated in organic texts in the past have been omitted, and only their more efficient modern counterparts are included. At the same time, however, in the overall choice of subject matter we have been cognizant of the differences in emphasis stressed by different teachers and have tried to include sufficient choice so that the text is not unduly restrictive. Concomitantly, there has resulted an increase in the subject matter presented over that found in most other introductory texts. We believe that the advantages to the teacher and student of a broad choice in subject matter are obvious.

The text is profusely illustrated, although illustrations are limited only to those which are pertinent to a better understanding or appreciation of the topic under consideration. For the benefit of both teacher and student each chapter is followed by an extensive supplementary reading list referring to pertinent articles in the *Journal of Chemical Education* and *Scientific American*. A number of questions of graded difficulty for each chapter are provided at the back of the text.

We are indebted, for their helpful comments, to Drs. Harry S. Mosher, Arthur Kornberg, and Hubert S. Loring of Stanford University and Drs. Ronald Watanabe, Harold J. DeBey, and George A. McCallum of San Jose State College, each of whom read portions of our manuscript, and to Dr. James A. Marshall of Northwestern University, who read the entire manuscript. For the artwork, illustrations, and equations we are grateful to Mrs. Allison Scott-Cassel and Mrs. Tatiana Hunter. Those photographs not bearing acknowledgment were prepared by one of us (W.A.B.); for the others we express appreciation to the firms or individuals listed. In particular, we are grateful to Mrs. Elisabeth H. Belfer of the Reinhold Publishing Corporation for her patience, encouragement, and editorial assistance.

The authors solicit your suggestions for improvement of the text.

W. A. B.

A. J. C.

To the Student

LEARNING organic chemistry—and many other subjects—may be approached in two ways: we may learn the subject, or we may learn merely *about* the subject. Learning *about* a subject involves relatively passive reading or listening in order to become more or less acquainted with its principal content. Learning a subject, however, implies active participation in the manipulation of the intellectual and physical tools which the particular discipline employs. You may learn a little *about* organic chemistry by merely reading this text. To obtain a preliminary operational knowledge of the subject, however, you must devote both time and thought to the questions for each chapter.

The study of organic chemistry is much like that of a foreign language. First, a good deal of memory work is required—an essential feature for which no apology can be made. Second, the nomenclature and symbolism of organic chemistry are much akin to vocabulary and alphabet, but will prove rather more precise. Third, general organic reactions are analogous to the grammatical syntax of a foreign language, and “exceptions to the rules” prove to be very important in both disciplines. A necessary skill for organic chemistry is the facile ability to apply *general* equations and principles to particular problems in varying contexts. This need to go “from the general to the particular” is perhaps the most difficult aspect of the subject at the outset, much as the most difficult exercise at the start of a foreign language is the conversion of vocabulary and grammatical rules into correct and meaningful sentences. The chapter questions are graded in difficulty and are designed to develop this facility.

There is no single technique which minimizes the effort required in mastering organic chemistry, or, for that matter, any other subject. Some students find that careful rewriting of their lecture and reading material is a useful learning aid. Some discover that “flash cards” of names, equations, and reaction conditions are equally helpful. Others find that work-

ing in small groups, with extensive cross-questioning, is useful in clarifying concepts and developing optimum answers to questions having a multitude of answers. The common feature in all of these learning techniques is *active participation*, without which an operational understanding of organic chemistry is impossible.

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ORGANIC CHEMISTRY

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