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Basic Principles of Organic Chemistry, second edition

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Abstract

PREFACE: No period in the history of organic chemistry has been as dynamic and productive of accomplishment as the twelve years between the completion of the first and present editions of *Organic Chemistry*. New reagents, new reactions, and extraordinary syntheses have been manifold. New techniques and instruments for analysis and determination of structures, improved methods for theoretical calculations, new junctures with physical, inorganic, and biochemistry, have made organic chemistry an end in itself. But along with this "best of times," there is a "worst of times" coming from the realization that many widely used organic compounds are more toxic than previously suspected. Some are carcinogenic, some are destroying the ozone layer in the upper atmosphere, which protects all life from the sun's strong radiation; others are concentrated and persist in living tissue to as yet unknown effect. Nonetheless, we have come to depend on synthetic organic chemicals, and we may ponder the fact that in just a few years the petroleum that makes so many useful organic compounds easily available will be in very short supply in the world. It has been a real challenge for us to try to cover the elements of modern organic chemistry with sufficient breadth to anticipate the interests and needs of the future chemists, biologists, physicists, and engineers, who constitute the majority of those who study the subject, and, at the same time, to give a balanced view of both its current accomplishments and difficulties. Our attempt has resulted in a book that may appear unwieldy. Between editions, we often received suggestions from professors to write

just the material I need in my course," but no two ever seemed to agree on what "the" material is. The discipline has now progressed in breadth and complexity that no simple short text can suffice. The old-fashioned grocery store can compete with the supermarket to supply the diverse needs of a community. To a degree, our book has a parallel to a supermarket because not only do we cover the important ones in detail. There is no intention on our part to supply just the right amount for some particular course of study. Instead, we intend to provide a broad enough range of topics to accommodate almost any desired emphasis or approach to the subject. More on our objectives with regard to different approaches to the study of organic chemistry is given in the latter part of Section 1-5 (p. 24). This is a substantial break with tradition in the matter of organic nomenclature. It was difficult to decide what changes in this area are very hard to achieve, perhaps for the reason that they threaten the viability of what is published and, indeed, even our customary forms of verbal communication. One of the authors vividly recalls the protests of his thesis supervisor to the idea of acquiescing to the admonition of a major nomenclature authority who felt that "crotyl chloride" and "methylvinylcarbinyl chloride" represented just too much of a departure from traditional nomenclature systems for isomeric compounds. "But we've used those names in nineteen earlier editions." Nonetheless, organic chemists and organic chemistry will surely be better off to name these same compounds systematically as 1-chloro-2-butene and 3-chloro-1-butene. Use of systematic nomenclature is a conservation - we all recognize it is necessary, but we would just as soon the start be made after the phenomenal growth of organic chemistry during the past decade and the switch by the indexes and Abstracts to use much more systematic nomenclature suggests that the right time is now. The approach taken in this book to the nomenclature problem is described in more detail in Chapter 3 (pp. 49-51) of the earlier edition, considerable attention is given to the application of the principles of thermodynamics, mechanics, kinetics, and spectroscopy to understanding and correlating the myriad of seemingly unrelated phenomena of organic chemistry. Much of this material could be appropriately categorized as belonging to a "Fuller Explanation," and rightly so because it represents a real attempt to achieve a genuine understanding of difficult points of fact and theory. Examples include rather detailed discussions of the properties and differences between resonance and molecular-orbital treatments of valence, ionization strengths, the origin of spin-spin splitting and kinetic effects in nuclear magnetic resonance spectra, reaction mechanisms in photosynthesis, carbohydrate metabolism, peptide-sequence determinations and peptide synthesis, and reactions of transition-metal compounds. It will not be possible to cover many of the topics of a usual one-year course, but many options are possible, as well as opportunities for individual students. Many individuals contributed to the progress and content of this edition. Special thanks are due for their comments to the reviewers, in particular to Professor George E. Hall of Mount Holyoke College, who read and commented on not only on the whole of the first draft but also a much-revised second draft. Helpful suggestions also came from Professors Robert E. Ireland, Robert G. Bergman, W. A. Goddard III, and John H. Richards of the Institute of Technology, Jerome Berson of Yale University, Ernst Berliner of Bryn Mawr College, and J. E. Guillet of the University of Chicago, J. E. Guillet of the University of Toronto, and Dr. John Thirtle of East Tennessee State University. Students at both Caltech and the University of California at Irvine participated in class-testing the manuscript and contributed significantly to the final draft. We owe them much for their patience and helpful suggestions over the years, many teachers and students have taken time to send us their comments regarding the manuscript. Many of these suggestions have been very helpful in preparing the second edition. Also, we are indebted to our respective colleagues for providing the encouragement that makes an endeavor of this kind possible. The first drafts were prepared in part while one of us was on leave at Stanford University and the other at the University of Hawaii. We are very appreciative of the substantial assistance and hospitality provided by these institutions. The manuscript and its interminable revisions were typed with skill and patience by Ms. Rose Meldrum. Special thanks also go to Ms. Margaret Swingle. It was a pleasure to work with Mr. Georg Klatt who did the final proofreading. Mary Forkner who was the production supervisor. The index was prepared with a HP9830 calculator. It would never have been possible to alphabetize and edit the 7500 entries without the help of equipment provided by Mr. Stanley Kurzet of Infotek Systems. Special thanks are due to Drs. James L. Hall and Jean D. Roberts (and Ms. Patricia Sullivan) for their seemingly tireless efforts and continual contributions through the years of editing and proofreading. Finally, the patience of our families during the several years that it has taken to produce this book is worthy of very particular mention and appreciation. As before, we will be

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