

# Organic Chemistry: The Fundamental Principles v. 1

Finar, I.L.

Note: This is not the actual book cover

# ORGANIC CHEMISTRY

VOLUME ONE  
THE FUNDAMENTAL PRINCIPLES

By

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The fourth impression of this book was retitled *Organic Chemistry Volume One: The Fundamental Principles*, as a second volume, dealing with Stereochemistry and the Chemistry of Natural Products, is now published and is designated Volume Two.

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## PREFACE TO THE FOURTH EDITION

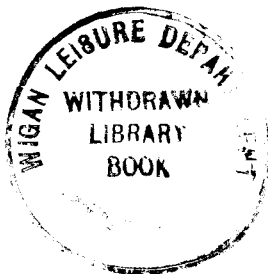
THIS book has been revised to bring it up to date. At the same time I have rewritten many sections on mechanisms, the added material being an elementary account of the sort of evidence that has led workers to suggest the mechanisms that are acceptable at the present time. This treatment should be more interesting to the reader, and will give him a better understanding of this branch of organic chemistry.

Expanded subjects include quantum numbers, resonance, free radicals, 1,2-shifts, allylic rearrangements, substitution at a saturated carbon atom, Walden inversion, hyperconjugation, the Diels-Alder reaction, aromaticity, aromatic substitution, configuration of oximes, etc. Additional matter includes shapes of molecules, structure and reactivity, transition state theory of reactions, correlation and specification of configuration, ion-pairs, neighbouring group participation, molecular overcrowding, mechanisms of hydrolysis and esterification, Wittig reaction, hydroboration, kinetically and thermodynamically controlled products, principle of microscopic reversibility, methylenes, Newman projection formulae, new reagents, etc.

A great deal of the mechanistic work is given in small print. This has been done to keep the book within a reasonable size. The various modifications of nomenclature by the *Chemical Society* have been described in the appropriate places in the text, but I have not used many of them since the cost of resetting so many names would have increased the price of the book out of proportion to the advantage gained. Since a summary of nomenclature, including some of the changes, has been given in the Appendix, the reader should not have any difficulties with this problem.

I. L. FINAR

December, 1961



## PREFACE TO THE THIRD EDITION

THE fourth impression of this book (1956) was retitled *Organic Chemistry Volume One: The Fundamental Principles*, and since then *Volume Two: Stereochemistry and the Chemistry of Natural Products* (1956) has appeared. The latter volume is, in effect, a continuation of the former, and so some material that has been described in this volume (I) in a relatively elementary manner, particularly Stereochemistry, has been dealt with far more fully in Volume II.

Volume I has now been revised in order to bring it up to date. This has meant rewriting many sections, and at the same time I have made some additions which, I hope, will improve the value of this book. It may be useful if I indicate briefly the more important changes I have made in this new edition. Rewritten and expanded subjects include dipole moments, resonance, S<sub>1</sub> and S<sub>2</sub> mechanisms, steric effects, tautomerism, hyperconjugation, organolithium compounds, stereochemistry, Diene synthesis, carbohydrates, aromatic substitution, transition state, and heterocyclic compounds. Additions include the use of isotopes, molecular diagrams, molecular crowding, E<sub>1</sub> and E<sub>2</sub> mechanisms, inclusion complexes, conformation, ferrocene, *cycloalkynes*, *paracyclophanes*, *ortho-para* ratio in aromatic substitution, and *cine*-substitution.

In addition to these changes, I have added many mechanisms for various reactions and at the same time have used the more recent methods of writing mechanisms. I have also rewritten aromatic systems with double bonds.

Once again I wish to thank those reviewers, correspondents and many of my students who have pointed out errors and have made suggestions for improving the book.

I. L. FINAR.

October, 1957.

## PREFACE TO THE SECOND EDITION

THE aim of this book has remained unchanged. Since I do not consider the chemistry of natural products fundamental chemistry but rather the application of fundamental principles, I have excluded almost completely the study of natural products. It is my hope, however, to write a companion volume in which I shall deal with further aspects of stereochemistry and also with the chemistry of many classes of natural products.

In this second edition, I have taken the opportunity to correct various errors in the text. I wish to thank those reviewers, correspondents and many of my students who brought these errors to my notice, and also made suggestions for improving the book.

In this edition I have used the alphabetical order of naming prefixes, and I have described the older method on p. 784. The principal additions include a more detailed account of molecular orbital theory, some further aspects of stereochemistry, various heterocyclic compounds, and a number of dyestuffs.

My original intention was to deal with molecular orbital theory in the future companion volume. I came to the conclusion, however, that the treatment of this subject is best dealt with in this book. I have therefore given an elementary account of molecular orbitals in Chapter II, and I have discussed their applications throughout the text alongside the resonance theory so that the student can gain some knowledge of both theories. In order to keep the size of this book within reasonable limits, I have used smaller type for much of the additional matter.

It is impossible to express my indebtedness to those authors of monographs, articles, etc., from which I have gained so much information. I can only hope that some measure of my gratitude is expressed by the references I have given to their works.

I. L. FINAR.

1953

## PREFACE TO THE FIRST EDITION

IN this book my aim has been to describe the fundamental principles of organic chemistry. Although the book has not been written with any particular examination in view, nevertheless the subject matter covers most of the organic chemistry required for the General Honours degree of the London University. It also covers a large amount of the organic chemistry of Part I of the Special Honours degree in chemistry of the London University, and a number of sections of this book should serve as an introduction to Part II.

To many beginners organic chemistry may seem to consist of a large variety of methods and reactions which appear to be isolated and, consequently, only to be learned by heart. After many years' experience of teaching organic chemistry to degree students, I have found that the best method of instruction is by the introduction of electronic theories as early as possible, with a constant application of their principles. These electronic theories give to organic chemistry a certain coherence that is soon appreciated by the beginner, and thus facilitate his study in this branch of chemistry. Stress has been laid on structural formulæ, properties of compounds, and reaction mechanisms. Special attention has been given to the systematic nomenclature of organic compounds. The alphabetical order of naming prefixes was adopted by the Chemical Society in April, 1950. This book was completed before this date and so this method has not been used. The reader, however, should have no difficulty in locating a compound in the index.

It is my experience that only a fairly detailed study of this subject matter enables the student to appreciate the problems involved. Too short an account usually leaves the impression that "everything works according to plan". This is undesirable for those who are expected to acquire a certain amount of factual knowledge and at the same time learn to think for themselves. I have therefore included detailed discussions on developments of a straightforward nature and also of a controversial nature, in the hope of encouraging the student to weigh up the evidence for himself. This will also give him an idea of some of the problems being investigated at the present time, and will show him that many "facts" are subject to change. Controversial material and the more advanced sections have generally been printed in small type.

Only by reading original papers in which are described the "whys and wherefores" can the student hope to gain a more mature outlook. A selected number of reading references have therefore been given at the end of each chapter. Since summaries of various topics by workers in special fields are of great value in extending the student's knowledge, references of this type have also been included. An account of the literature of organic chemistry has been given in an appendix.

In describing methods of preparation of various compounds, I have given, wherever possible, actual percentage yields (taken mainly from *Organic Syntheses*). The student will thus be enabled to assess the value of a particular method. Where general methods of preparation have been described, the yields have been indicated according to the following (arbitrary) scheme:

0-15% very poor (*v.p.*); 16-30% poor (*p.*); 31-45% fair (*f.*); 46-60% fairly good (*f.g.*); 61-75% good (*g.*); 76-90% very good (*v.g.*); 91-100% excellent (*ex.*).

At the end of each chapter there are questions designed to test the student's "book knowledge" and to test the application of his book knowledge. At the end of the book there are also fifty questions chosen from various examinations—B.Sc. General and Special Honours of the University of London, and the Associateship and Fellowship of The Royal Institute of Chemistry. I should here like to thank these Examining Boards for permission to reproduce these questions.

It is hoped that the method of presentation in this book will stimulate the reader's interest in organic chemistry and enable him to read with understanding original papers and monographs covering specialised fields.

I should like to acknowledge the valuable help given me by Mr. K. Merton in reading the manuscript and by Miss A. B. Simmonds, B.Sc., Ph.C., A.R.I.C., in reading the proofs.

I. L. FINAR.

*July, 1950.*



## LIST OF JOURNAL ABBREVIATIONS

ABBREVIATIONS.	JOURNALS.
<i>Angew. Chem.</i>	Angewandte Chemie (the name Die Chemie was used for vol. 55, 1942, to vol. 58, 1945).
<i>Ann. Reports (Chem. Soc.)</i>	Annual Reports of the Progress of Chemistry (The Chemical Society, London).
<i>Ber.</i>	Berichte der Deutschen Chemischen Gesellschaft (name now changed to Chemische Berichte).
<i>Chem. Eng. News</i>	Chemical and Engineering News (American Chemical Society).
<i>Chem. Reviews</i>	Chemical Reviews.
<i>Chem. and Ind.</i>	Chemistry and Industry.
<i>Helv. Chim. Acta</i>	Helvetica Chimica Acta.
<i>Ind. Eng. Chem.</i>	Industrial and Engineering Chemistry.
<i>Ind. Eng. Chem. (Anal. Ed.)</i>	Industrial and Engineering Chemistry (Analytical Edition) [name now changed to Analytical Chemistry].
<i>Ind. Eng. Chem. (News Ed.)</i>	Industrial and Engineering Chemistry (News Edition).
<i>J. Amer. Chem. Soc.</i>	Journal of the American Chemical Society.
<i>J. Chem. Educ.</i>	Journal of Chemical Education.
<i>J.C.S.</i>	Journal of the Chemical Society.
<i>J. Org. Chem.</i>	Journal of Organic Chemistry.
<i>J. Roy. Inst. Chem.</i>	Journal of the Royal Institute of Chemistry.
<i>J.S.C.I.</i>	Journal of the Society of Chemical Industry.
<i>J. Soc. Dyers and Col.</i>	Journal of the Society of Dyers and Colourists.
<i>Nature</i>	Nature.
<i>Proc. Chem. Soc.</i>	Proceedings of the Chemical Society.
<i>Quart. Reviews (Chem. Soc.)</i>	Quarterly Reviews of the Chemical Society (London).
<i>Rec. trav. chim.</i>	Recueil des Travaux Chimiques des Pays-Bas.
<i>Research</i>	Research.
<i>Science</i>	Science.
<i>Tetrahedron</i>	Tetrahedron.
<i>Trans. Faraday Soc.</i>	Transactions of the Faraday Society.