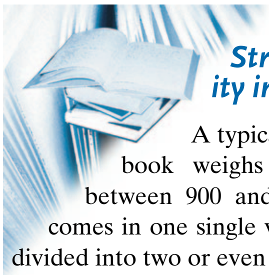

Structure and Reactivity in Organic Chemistry

A typical organic chemistry textbook weighs about 3.5 kg and has between 900 and 1500 pages. Usually it comes in one single volume, but is sometimes divided into two or even three volumes. However, the European Space for Higher Education recommends (I will say compels) using a single textbook for each topic that is being taught and, more importantly, learned. This book by Mark G. Moloney is a tour de force that aims to condense the essential knowledge of organic chemistry and a good morsel of organometallic chemistry into just 301 pages. Naturally, to achieve this goal a high price has to be paid. This textbook aims to cover the essentials of organic chemistry by using the mechanistic approach. However, the range of topics covered is so huge that the text becomes a sequence of facts and superficial explanations having little pedagogic value. You have to know much organic chemistry to follow the ideas, mechanisms, and reactions compressed in the text.

Chapter 1 explains bonding in organic molecules. This chapter sets the philosophy underlying the whole book. It begins with a high-school level picture of the chemical bond, even showing how organic molecules are drawn, and a few pages later we are in the middle of stereo-electronic effects. This conceptual zooming is the main characteristic of the book, and it is maintained through the whole text. Chapter 2 explains the structure of organic molecules, from the simplest notions of stereoisomerism to the use of chiral shift reagents and chiral shift solvents in NMR spectroscopy. In between, concepts such as $A^{1,3}$-strain (allylic strain) are employed to discuss the conformations of cycloalkanes. Chapter 3 is devoted to thermodynamics, kinetics, and reaction mechanisms. Intermediates in organic reactions are discussed in Chapter 4. The structures of carbocations, carbanions, and free radicals are discussed, together with the factors that stabilize these intermediates, the methods for generating them, and some main-group organometallic reagents. The relative stabilities within a class of intermediates are discussed along classical lines based on a combination of inductive and conjugative effects, but excluding the concept of hyperconjugation. Chapter 5 is devoted to acidity and basicity, discussing compounds so diverse as carboxylic acids and pyrrole.

These five chapters present the general concepts that are necessary to understand the following chapters, which deal with specific classes of organic reactions. Chapter 6 is devoted to nucleophilic substitution. This chapter incorporates concepts as diverse as the factors affecting the rates of S_N reactions, and stereocontrolled alkylation reactions using chiral internal auxiliaries. Chapter 7 covers topics that range from the simple drawing of the mechanism of electrophilic addition to $C{=}C$ bonds to that of the nucleophilic addition to carbonyl groups. The reactivity of boranes, asymmetric catalytic hydrogenation, and the Sharpless asymmetric epoxidation and dihydroxylation reactions are followed by asymmetric addition to carbonyl groups. The Cram and Zimmerman–Traxler models are also mentioned.

Elimination is treated in Chapter 8. Unimolecular (E1) and bimolecular (E2) mechanisms are followed by oxidation reactions. The α-elimination reactions leading to carbenes are presented together with phosphorus- and selenium-mediated reactions to form double bonds. Chapter 9 discusses aromaticity, covering all aspects of the field in 12 pages, from the concepts of aromaticity and anti-aromaticity to arene–chromium(0)tricarbonyl compounds. Aromatic electrophilic and aromatic nucleophilic substitutions are described at length, including those of polynuclear and heteroaromatic compounds. The reactivity of arylsilanes and benzyne intermediates is also incorporated in this chapter. The synthesis of heterocycles is discussed, in both the normal and asymmetric versions. Chapter 10 is devoted to nucleophilic substitution–elimination reactions, mixing together enols and enolates, the formation of double bonds, and metathesis reactions. Free-radical reactions are extensively described in Chapter 11, while Chapter 12 is a compilation of organometallic chemistry with applications in synthesis. The book ends with an extensive description (including an MO treatment) of the whole range of pericyclic reactions in just 18 pages.

As I stated above, a high price must be paid if the whole of organic chemistry has to be condensed into 300 pages. This book has plenty of knowledge, but the penalty is the loss of its value as a textbook (furthermore, it is aesthetically awful, the placing of the schemes is random, and the drawings are unappealing). This book will be extremely useful as a guide to the essentials of modern organic chemistry, provided that you have a very good knowledge of organic chemistry or an excellent teacher to guide you through it. However, the book probably reflects the future of university education in Europe: to give students a very condensed view of a discipline that is enough to fulfill the requirements for obtaining a degree.

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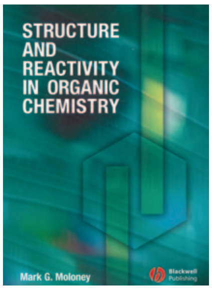

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