Book Reviews

Spectroscopic Methods in Organic Chemistry. By M. Hesse, H. Meier, B. Zeeh. Thieme: Stuttgart, 365 pp, hardback. DM 168. ISBN 3 13 106061 1. Softback. DM 78. ISBN 3 13 106041 7.

Spectroscopic methods play a key role in both teaching and research in organic chemistry. Therefore, organic chemists need to understand the theoretical basis of each method and be able to apply them to solve chemical problems and, in particular, those concerning structure elucidation / confirmation. All university degree programmes in chemistry offer such a course and, as a backup to material covered in lectures, students require a well-written textbook in this area. This textbook by Hesse et al. , which is the first English translation of the successful 5th German edition, is aimed and priced at this market.

The four major methods of UV / Vis spectroscopy, IR / Raman spectroscopy, NMR spectroscopy and mass spectrometry are covered in separate chapters. Each chapter has a discussion on the theory behind the method, the instrumentation used and details of sample preparation and spectral measurement. The main concepts are then introduced in a well-thought out manner and the usefulness of the particular method is illustrated with suitable examples and applications along with excellent reference tables. The end of each chapter has invaluable literature references to other general texts, data collections, applications, review articles and monographs for each method. The final chapter has worked examples of applying the four methods in combination for structure elucidation and problem solving.

The chapter on UV / Vis spectroscopy covers the standard olefin, polyene, aromatic and carbonyl chromophores and has useful tables of typical UV absorptions and worked examples of Woodward's rules. Derivative spectroscopy and chirooptical methods such as specific rotation measurement, optical rotation dispersion and circular dichroism are also introduced. The chapter on IR / Raman spectroscopy gives a good overview in tabular form of characteristic absorptions and is followed by a functional group analysis of typical absorptions. Although only useful in specialised cases, Raman spectroscopy is also discussed.

The chapter on NMR spectroscopy, which takes up close to half of the book, is particularly well-written and covers ^{1}H and ^{13}C in detail giving excellent tables of chemical shifts and assigned representative examples of important classes of organic compounds. Unlike a lot of similar textbooks, NMR data of other important nuclei such as ^{31}P, ^{19}F and ^{15}N is given here. 2D- and 3D-NMR techniques such as COSY, ROESY, NOESY, INADEQUATE, HETCOR are well-introduced. The pulse techniques of DEPT and INEPT are also explained well.

The chapter on mass spectrometry details the characteristic fragmentation reactions of the different functional groups and this section is illustrated with relevant mass spectra. Apart from the standard electron impact technique, the additional techniques of chemical ionisation, electrospray ionisation, fast atom bombardment, field desorption, field ionisation and the measurement of high masses are also described. The chapter finishes with an excellent series of reference tables for use in mass spectrometry.

The final chapter gives seven worked samples of how to solve the problem at hand with the aforementioned spectroscopic methods. These examples are well chosen and are clearly explained to the reader. Perhaps extra problems of structure elucidation in which 2D-NMR techniques are used, would have added something more to an already excellent textbook. Likewise, more problems, without being given the answers, would prove useful to students willing to test their knowledge of how to combine spectroscopic methods to solve problems.

In summary, this is an invaluable textbook for students attending courses on spectroscopy in organic chemistry and I have modified my own lecture course in this area after reading this book. It also serves as an indispensable reference textbook for research chemists. I strongly recommend it.

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Indoles. By R. J. Sundberg. Academic Press, 1996, 175 pp, hardback. £ 45. ISBN 0 12 676945 1.

This book is another volume of the series "Best Synthetic Methods"which is now 10 years old. This volume is the first of a new sub-series with a focus on heterocycles and their synthesis. The author R.J. Sundberg is a noted indole chemist whose older book (1970) "*The chemistry of indoles*" is a standard.

This book provides a guide to the most important methods for construction of the indole ring and is timely bienvenue after the review of GW. Gribble in *Contemporary Organic Synthesis* and recent coverage in reference sources such *as Comprehensive Heterocyclic Chemistry (2nd Ed).* Regarding the requirement of the need for a detailed and inexpensive monography this book would definitely fill a gap in what is currently available in book form. The underlying organization of this book is on the basis of retrosynthetic concept of identifying the bond(s) which are formed in the process. It had the ambition and succeeded in, presenting in a concise and practical way the most widely used synthetic methods. More than 70 detailed experimental procedures drawn from the literature (up to 1995) and tables are presented to indicate both the scope of applicability and variations in methodology of the described methods.

The book is divided in 3 parts; following the introductory chapter the first part is devoted to ring construction (Chapters 2-8); the second part focuses on methods for introduction of substituents on the indole moiety (Chapters 9-14). The third part deals with the oxidation/ reduction reactions of indole derivatives (Chapter 15) and cycloaddition reactions using vinylindoles and quinodinemethane type intermediates, as the diene component (Chapter 16).

Chapters 2-7 deal with methods for construction of the indole ring from benzenoid precursors. The formation of the N-C2 bond is the subject of the Chapter 2 and is illustrated with the Leimgruber-Batcho synthesis and the *endo-dig* addition of o-aminophenylacetylene in the presence of Pd(II) catalysts. The Hemetsberger synthesis from azidocinnamates which allows the formation of the N-C7a bond is described in Chapter 5. Fischer and Japp-Klingemann syntheses are the subjects, well-documented, of Chapter 7. Annelation of pyrroles is another less used approach to the indole nucleus developed in Chapter 8.

The reactivity of the position 1, 2, 3 of the indole moiety is described in Chapters 9-11; as an illustrative manner, Heck reactions or metallation of the 2-position is reported in chapter 10. Gramine and tryptamine chemistry are respectively the topics of Chapters 12 and 13. Electrophilic substitutions and organometallic reactions allowing the introduction of substituents on the carbocyclic ring are reported in Chapter 14. Finally specific oxidation and reduction of indoles are described in Chapter 15 and the book ends with cycloaddition reactions for generating indoles. In each chapter, the author has succeeded in illustrating and updating the standard indole syntheses and introducing new ones.

The general authoritative survey of indole chemistry in 175 pages is an amazing feat. More than the listing of the numerous methods of creating the indole ring, the greatest challenge is the methodical mind with the retrosynthetic concepts of identifying the bond formed. In each chapter the coverage is up to date. There are few typographical errors (p1, p18, p29, p132) and the book is pleasant to read. Nevertheless the tables are not illustrated with reaction schemes and this is slighly disturbing. The Bartoli indole synthesis and Grigg's cascade reactions with Pd(II) catalysts are not reported, but for a concise book it is impossible to treat all the aspects of indole chemistry. It allows the non-specialist of indole chemistry to get in very quickly and to find answers. For heterocyclic chemists, generally their personal experience encompass only a fraction of the methodologies included in this book. This excellent book is highly recommended.

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Exercises in Synthetic Organic Chemistry. By C. Ghiron, R. J. Thomas. Oxford University Press: 1997, 138 pp, hardback. £ 40. ISBN 0 19 855944 5.

In the preface, Ghiron and Thomas state that the purpose of their book is to provide people of varying abilities with synthetic problems taken from the recent chemical literature. These problems are designed to increase the reader's awareness and appreciation of the enormous array of synthetic methods that are

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currently available to the practising synthetic chemist. The book is aimed at final year undergraduates and postgraduate students, as well as more experienced practitioners in the field of organic synthesis. Although it can be used for study by the individual, the very nature of the problems means that they are well suited for group problem solving sessions.

Exercises in Synthetic Organic Chemistry consists of a large number of synthetic problems based upon published syntheses of natural products and related systems. In total, 82 separate problems derived from the recent chemical literature (1990-1996) are included. Each problem is based upon a multistep reaction sequence leading to a target molecule or a fragment thereof. The schemes are deliberately incomplete with a number of the intermediates and reagents missing. The reader is asked to follow the chemistry involved in the reaction sequence determining the structures of the missing intermediates and suggesting reagents to accomplish the required transformations. The advantage of problems based upon such "route maps" is that readers of varying abilities can tackle the same problems. If one gets stuck on a particular transformation, one can simply move on. Since no answers are provided in the book, the reader must refer to the original research paper for the solutions. The reference to the original article is provided at the beginning of each problem and since all the problems are taken from common chemistry journals, virtually everyone using this book will have access to the *real* solutions.

For each problem, the authors have included several points for further discussion which focus on key steps in the synthetic sequence. These discussion points usually centre on the mechanism of particular transformation, on why a particular set of reagents were employed, or on some issue relating to chemo- or stereoselectivity. For each problem, the authors have also included other references for further reading. They refer the reader to more detailed articles on a given reagent or reaction used in the problem, or to alternate approaches to the same target molecule.

I do have a few minor criticisms of the book. By just selecting syntheses published in the 1990's, I did feel that the authors unnecessarily limited themselves in their choice of material for the problems. Furthermore, in working through the problems, I was occasionally irritated by the fact that the answers to some of the discussion points were not to be found in the cited research paper on which the problem was based. In these instances, it would have been helpful to have been referred directly to a paper which addresses the issue raised in the discussion point, rather than having to spend time chasing back to it from the cited research paper.

In summary, I believe that Ghiron and Thomas have produced a very good set of synthetic chemistry problems which are ideally suited for group discussions. The problems should challenge and stimulate synthetic organic chemists of varying abilities and I am certain that my research group will have many thought provoking discussions based upon the problems provided in this book.

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