Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Published by Universities Press, Hyderabad, 2013, Pages VIII + 460, Price (Amazon.in) Paper back Rs. 560.00; (Orient Black Swan) Paper back Rs. 650.00; (CRC Press) Hard cover £ 94.35.

The author, Professor G. L. David Krupadanam has written the book entitled “Fundamentals of Asymmetric Synthesis”, based on his vast experience for more than two decades in teaching advanced courses on asymmetric synthesis at the Osmania University, Hyderabad.

The introductory Chapter 1 and the following three chapters deal with the needed background knowledge. Chapter 1 deals with (i) the facts that the living organisms synthesize only one stereoisomer among all possible stereoisomers through enzyme mediated reactions, (ii) the need for stereoselective synthesis since stereochemical discrimination in the drug-receptor interactions leads to four possible situations in case of chiral drugs: (a) one enantiomer with the same drug activity, the other one being inactive, (b) both enantiomers with the same drug activity, but to different extents, (c) one enantiomer with the desired drug activity, the other being toxic, and (d) enantiomers with different drug activities. Chapter 2 lists the terms, definitions and concepts unique to asymmetric synthesis. Chapter 3 describes the properties of enantiomers under both achiral and chiral measurement conditions. Chapter 4 deals with the concept of prochirality and different related terms.

The book then deals with the basic concepts, terminology, mechanistic aspects, and various synthetic applications of asymmetric synthesis organized elegantly in Chapters 5-17, covering some recent new reactions, viz., chiral organometallic catalyzed asymmetric reactions (Chapters 12 and 13), which have been widely used by organic chemists for developing new shorter routes for the synthesis of complex natural targets and drugs. These reactions were discovered in 1980s and 1990s leading to the award of the Nobel Prize in Chemistry in 2001 to K. B. Sharpless, W. Knowles, and R. Noyori.

Enantioselectivity and diastereoselectivity in asymmetric aldol and Diels-Alder reactions have been described in Chapters 15 and 16, while Chapter 17 describes some stereoselective and stereospecific reactions.

The central theme of the book – the structural, symmetry, and TS energy requirements for enantioselective and diastereoselective synthesis – has been dealt with in Chapter 5.

At the end of the book four informative and useful annexures have been added. Annexures 1 and 2 deal with the basic concepts – symmetry elements, symmetry operations and point groups, while Annexures 3 and 4 deal with the characteristic molecules with one, two, or more chiral centers.

It is more desirable that the different point groups with examples (pp. 438-440) are explained in detail so as to make them recognizable by the beginners.

Some strong points of the book are as follows:

(a) Problems and exercises (total 117) directly linked to concepts taught in each chapter, excepting Chapters 1 and 2 are presented.

(b) The knowledge that one will gain after studying the chapters are nicely stated under the objectives given before the start of each chapter. Thus the
post-chapter check-lists of the important concepts have been provided.

However, I find with surprise the following omissions / discrepancies.

(1) **Supplementary reading**

(a) In Chapter 1 seventeen standard reputed books have been cited, but the stereochemistry books by E. L. Eliel, D. Nasipuri, P. S. Kalsi, and S. Sengupta are missing, although they are more or less recommended in advanced undergraduate and post-graduate classes in India and many other countries. In the next edition these books are desired to be cited under this heading.

(b) The journal references (total ~ 51) given in Chapter 6 (9 references), Chapter 8 (11), Chapter 9 (4), Chapter 12 (8), Chapter 13 (3), Chapter 15 (5), and Chapter 16 (2) have not been cited in the text. Hence, these references without titles do not give any idea about their topics unless at least an author’s name is mentioned in the text. I hope this lacuna will be rectified in the next edition of the book.

(2) **Nomenclatures**

(D,L)-Nomenclature for centrally chiral compounds, and (R,S)-nomenclatures for central, axial and planar chiralities which appear in the compounds cited, should be explained and discussed in detail, (R,S)-nomenclature in terms of chirality rule and priority sequence rule in another annexure (say, Annexure 5, without disturbing the present sequence). In absence of such an annexure it will not be possible for any uninitiated reader to appreciate the nomenclature of the absolute configuration of the chiral compounds, cited not only in Chapter 1 but also throughout the book. The beginner will assume/memorize the absolute configurations of the chiral compounds cited, arbitrarily without proper understanding. In many cases the priority sequence or the chirality rule can’t be applied easily.

In the Chapter 4 (prochirality) stereochemical nomenclatures, pro-R, pro-S, Re, Si, ReR, SiS, SiR, ReS have not been explicitly defined and should be included in the Annexure 5.

(4) The absolute configurations of the following compounds encountered are not correct and should be corrected as mentioned.

(a) P. 4 and p. 9. Chloromycetin (1.16) as drawn, is having (1R,2S) configuration, but actually chloromycetin has (1R,2R) configuration (p. 9, last but 5 lines). The structure should be corrected with the C-N bond planar (straight line) and not C- - - -N, as drawn.

(b) P. 11, Fig. 1.9. The structure of rotenone, a broad spectrum insecticide has been drawn correctly, but the configuration of C5 should be (S), and not (R) - as written.

(c) P. 41, and p. 170. The absolute configurations of chiral (R)- and (S)-binaphthols should be deduced by projection as in Scheme 7.24 (p. 171), and not as Newman projection - as shown, since the two naphthol rings are not perpendicular to each other but are like a cross structure.

(d) Acetophenone (4.56) (the 1st structure, p. 97, Fig. 4.20) and the planar carbocation (p. 443) have not been drawn correctly and should be corrected.

(e) P. 111. Scheme 5.14, the structure with R=Ph should be (R) and not (S).

(f) P. 139. (R,S) Nomenclature of (R)-MTPA or (S)-MTPA is not obvious and should be explained by indicating the priority sequence.

(g) P. 148, top right, >=OH should be >=O

(h) P. 192. The nucleophilic attack takes place at an angle 109 o (and not 107 o – as shown) to the carbonyl plane (Biirgi-Dunitz trajectory) (Fig. 8.3)

A list of errata as mentioned in (a) – (h) may be attached at the end of this book, if possible, for the benefit of the readers. If not, they should be corrected in the 2nd edition.

In Chapter 8 the mechanism of 1,2-, 1,3-, and 1,4-asymmetric induction reaction (nucleophilic) for acyclic ketones or aldehydes using the appropriate models (Cram, Karabatsos, Felkin, Felkin-Ahn, Cnforth, Reetz, Cram-Reetz, and Prelog) have been presented in a lucid matter. But the stereochemistry of nucleophilic addition to substituted cyclohexanones (Cieplak Model, 1981, 1989 –
involving molecular orbital interactions), its extension to 5-subshilated 2-adamantanones (Cheung, 1986), and 2,3-
endo-endo substituted 7-norbornanones (Mehta, 1990) may be included in another new section, viz., Section 8.5 in the 2nd edition.

The author deserves congratulations for efficiently covering the fundamental concepts of a very important rapidly growing vast subject, organized nicely in 17 chapters within a span of 460 pages. The book must find place in the libraries of the departments of chemistry in Universities and Research Institutes of India and abroad and may be in personal possession of interested researchers and students in organic chemistry.

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