

of the pre-Green Revolution era are based on high diversity associated with low productivity. The Green Revolution agriculture is essentially a combination of low diversity and high productivity. However, experience has shown that Green Revolution in its present form cannot be sustained: sustainability in agriculture, among other things, will depend on high diversity associated with high productivity. Thus our agriculture, animal husbandry, and forestry must work towards such a goal. This means it must fall somewhere in the right hand top square (Figure 1).

The last section deals with the vexing question of the socio-political aspects of biodiversity. The editors have done well to highlight the problems in the last three chapters. Here breeders' and farmers' rights, together with interconnection between biodiversity and biotechnology, have been discussed. The editors have also reproduced in toto the text of Biodiversity Convention and Keystone Dialogues at Oslo and Madras. A perusal of this material would help in better understanding and decision making.

The issue of biodiversity is far more complex and pregnant with tremendous possibilities for a country like India which is gene-rich, and is very strong in genetics and plant breeding and sufficiently strong in biotechnology as relevant to agriculture. However, knowledge base in wildlife (mostly mega animals) is still elementary. There is need for high degree of inputs from modern conservation biology, population genetics and biotechnology. In fact present day zoos and botanic gardens abroad are backed by a very strong biotech component. It is no longer a case of mere increase in number of animals in a given habitat.

There is a serious difference in the thinking of a politician, bureaucrat and scientist/technologist in relation to the time horizon of biodiversity. The life of a democratic government is essentially short. The politician wants gains in the short term and his eyes are on the next election: in any case his time horizon is not more than five years, it could be even a few months. Perception of the politicians about biodiversity has been aptly caught by our world-famous cartoonist, R. K. Laxman (Figure 2). A typical bureaucrat's eyes are on the next promotion. However, the age of an



Figure 2.

I delivered the speech you drafted and it was much appreciated. By the way, what is bio-diversity?

[R. K. Laxman, in *Times of India*, June 18, 1992, New Delhi].

ecosystem harbouring biodiversity is 100 years plus. Who then will provide a long range unbiased perspective on biodiversity for decision making? It has to be a Think Tank of hard core informed scientists, technologists and other professionals.

Keeping many of the foregoing aspects in mind, over six years ago, the Government of India was advised by the then Task Force on Environment, of the then Planning Commission, while M. G. K. Menon was the Member (Science). The Task Force was headed by M. S. Swaminathan. Two specific recommendations were forwarded to the Government. One of these was to have a National Biodiversity Conservation Board (NBCB) to look into scientific, technical, social, economic, legal and political aspects of biodiversity. The other recommendation was to appoint a Sustainable Development Advisory Committee to the Union Cabinet. No doubt such advice was ahead of time. Today after UNCED, several countries have constituted NBCBs, and the UN system itself has constituted an UN Commission on Sustainable Development. Most unfortunately our country is still embroiled with Wildlife Board. This Board has met *only once* after the assassination of Mrs. Indira Gandhi in 1984. In any

case this Board is defunct: it has lost its legitimacy, and is no longer valid.

Biodiversity is our major strength, and on it depends our survival. We can ill-afford to lose it. Despite stray attempts of some economists, proper economic valuation of biodiversity is still an enigma. The present book is most timely, because ours is basically an agricultural country: our problems are biological and their solutions are in the biotechnological domain. The editors and the publisher deserve congratulations for producing this book which will be read widely.

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Medicinal Chemistry. Ashutosh Kar. Wiley Eastern Ltd., New Delhi. 476 pp + Index. Hard bound. 1993, price: Rs 500.

Medicinal chemistry has received little attention in this country. It is mainly pursued by a few organic chemists and some pharmaceutical chemists. Persistent efforts by a few researchers have yielded therapeutically acceptable new molecules developed in India, e.g. Centchroman, Centbucridine (from CDRI), Chandonium iodide (from Punjab University).

These have been developed by tedious methods of step by step modification of lead compounds and exhaustive screening of analogues. Today with QSAR techniques, drug design aided by computer molecular modelling and graphics, better knowledge of biochemical processes at molecular level, etc., it would be possible to cut short the tedium of search for better drugs. The perfection of biotechnological methods is likely to shift the approach to peptide and nucleotide-related chemical molecules as medicinal agents. Already a number of such molecules are becoming available. Indian organic chemists have successfully devised new synthetic routes to latest drug molecules discovered else-

where in the world, thus effectively bypassing the patented processes (e.g. Ibuprofen, Omeprazole, Ciprofloxacin, etc.). This in fact has been the bone of contention between USA and India, forcing that country to the defensive, in bringing out the much-debated super 301 legislation. Medicinal chemistry also deals with drug molecule manipulation to obtain new derivatives (called prodrugs and soft drugs) with altered pharmacokinetic profiles (e.g. prolonged action, tissue targeting, increased solubility, improved taste, etc.).

In spite of all this, there are hardly any books and treatises published on this subject in India. Reputed medicinal chemists of our country have contributed excellent chapters in books published elsewhere (e.g. Nitya Nand's on Sulphonamides in *Burger's Medicinal Chemistry*). Thus I looked forward with expectation and enthusiasm, to go through the present book under review. The outcome has been rather disappointing. The author claims two objectives in writing this book: (i) to attract undergraduate students and (ii) to make this a reference book for the professional class. In my opinion neither objective has been achieved. The major thrust appears to be the inclusion of one or more synthetic routes to most of the compounds quoted in the book. This information is needed by students and teachers of medicinal and/or pharmaceutical chemistry. Unfortunately with the innumerable errors in the structural formulae and some defective synthetic routes, the only strength of the book has been ineffective.

Structures and synthetic routes

The errors include: (a) missing bonds (e.g. pp. 8, 31, 33, 133, 134, 139, 308, 334, 380); (b) missing atoms or groups: (pp. 140, 182, 221, 304, 330, 374, 452, 464; steroidal 5, 8, 14, H on pp. 434, 436, 440, 443); (c) additional atoms or groups (pp. 30, 48, 173, 174); (d) wrong positions of groups (e.g. pp. 9, 66, 465, 321-322); (e) wrong groups (pp. 30, 162, 163, 316, 465); (f) badly written structures causing confusion to students in particular (e.g. pp. 160, 292, 284, 243, 357); (g) wrong or misplaced structures (e.g. pp. 129, 276). Many of these are possibly due to poor proof reading and

a badly prepared manuscript. Some errors reflect bad production; e.g. (i) Disproportionate structures and/or substituents in a structure or of same structure in different places (pp. 33, 114, 115 badly joined rings; pp. 72-73, 89, 128, 129, different sizes of the same ring systems; p. 272 et seq. glaringly disproportionate bond lengths and bond angles of substituents on rings; pp. 31, 33, 316, wrong fonts for I, L, O causing confusion). (ii) Separation of synthetic scheme on subsequent pages leading to confusion about the correct continuity (e.g. pp. 201-202, 374-375) (iii) Printing and binding quality deserve greater attention.

Besides these, several errors appear to be due to faulty understanding of the subject, e.g. (a) Keto-enol tautomeric forms are referred as lactam-lactim forms: (pp. 159, 160); (b) Reagent names and structures are sometimes erroneous: ethyl orthoacetate for ethyl acetate (p. 202); chlorohydrin (p. 121); thiomethanol for methyl mercaptan (p. 264); sodium formaldehyde bisulphite for sodium formaldehyde sulphoxylate (p. 163); (c) Wrong sequence of synthesis: oximation should precede reduction (p. 400); (d) Wrong name of reaction step: debenzoylation for debenzoylation (p. 165).

Continuing on the structures and synthetic routes: Curious structures for atropine have been printed on pp. 242-243 giving an impression of a stereochemical representation. Unfortunately these are wrong and may mislead a student. It is not clear why certain routes of syntheses have been included. Readers could have benefited by explanation of choice of route, reagents, by-products, stereo- and regio-specificity, etc. The inclusion of more than one synthetic route for a few compounds (e.g. acetanilide, phenacetin, Ch. 9. both trivial and obsolete drugs) and trivial syntheses (e.g. chloroform, aniline, etc.) are superfluous as also repetition of the structure of a compound on the same page, once at the beginning of the topic and again in the synthetic scheme. The treatment of pure chemistry aspects like structure elucidation, degradation and synthesis of a few compounds (e.g. benzylpenicillin, Diel's hydrocarbon, atropine) are not relevant to the book, considering the omission of many essential topics.

Organization

There are 21 chapters, two on general topics, the remaining following a mixed therapeutic-pharmacologic-chemical classification (e.g. anticonvulsants, autonomic drugs, steroids). The sequence of chapters is not consistent with any grouping, as for example cardio-vascular drugs (Ch. 11) appears between analgesics (Ch. 10) and autonomic drugs (Ch. 12); steroids (Ch. 20) follows antimalarials (Ch. 19) and precedes antibiotics (Ch. 21). This inconsistency and confusion has crept into the sub-topics also. For example, sub-topics 'general considerations' and 'tailoring of drugs' (7 & 8 on p. 11) could have served as introduction at the beginning of Ch. 1 itself. So-called autonomic drugs should have been included under respective chapters (e.g. beta-blockers, ganglionic blocking agents, alpha blockers under cardio-vascular drugs, etc.). This chapter is badly organized. Similarly placement of certain drugs is not with their primary therapeutic application, but with a secondary use or action (e.g. Aminophylline, Etophylline, Proxyphylline, Dextromethorphan, Methotrimeprazine, Arylanthranilic acid derivs). This misleads a student. Another example is sub-classification of diuretics. Primarily they are classified as mercurials and non-mercurials, a poor choice of classification, considering the total disuse of mercurial diuretics since more than two decades. Further on p. 271 it is stated that the non-mercurial diuretics are further 'classified on the basis of the chemical structures'. But among the 10 listed classes are included: '(2) Carbonic-anhydrase inhibitors, (4) Aldosterone inhibitors, (5) 'Loop' or 'High Ceiling', (8) Osmotic, (9) Acidotic', all of which are nonchemical classes!

Subject matter

The first two chapters on general topics are more or less based upon Foye's and Burger's books. In the process of reducing bulk and attempting to simplify the complex topics of drug design, physico-chemical properties and biological activity, several distortions have taken place, making the topic incomprehensible to students and other readers alike. The author states on p. 1, 'Drug design implies random evaluation of synthetic and natural products in bio-

assay systems'. Note the inconsistent words. The concept of 'lead' is badly explained. Factually incorrect statements include Ehrhardt (1949) on p. 3, Meyer and Hemmi on p. 15, discovering of pethidine as rational development (p. 3), distance between the two OH-groups in structure D1 on p. 9 should be 12.1 Å and not 14.5 Å. Other not verifiable statements in the book are 'Configurational every half molecule of tubocurarine is identical to atropine... double rows of O-N attachment in d-TC and single row of O-N in atropine... as a possible explanation of the specific action of d-TC on the neuromuscular junction...'. On p. 177 cardiotonic actions have been attributed to digoxigenin. The sequence of sub-classes and drugs included do not reflect the development sequence. For example the thiazides are treated first and then the aromatic sulphonamides and still later the earliest osmotics and acidotics, in the chapter on diuretics. The inclusion of bile acids and saponins in the chapter on steroids is superfluous, unless they were related by citing them as useful raw materials for the synthesis of hormonal steroids. No such reference is found. On the other hand a curious statement appears on p. 452: 'They (saponins) have been used extensively in medicine (?) as foaming agents in fire extinguishers and as fish poisons'.

The book suffers from too many omissions: Under steroids corticosteroids and oral contraceptives are major omissions. Methyl testosterone, ethynylloestradiol and ethisterone are not even mentioned. Under cardio-vascular drugs coagulants and anticoagulants are not dealt with. Important drugs missing are: Nitrite and Nitrate vasodilators (anti-angina); Nifedipine, Atenolol, ACE inhibitors Captopril and enalapril, reserpine, lignocaine and phenytoin. Another major class of drugs not finding place in the book: Anti-psychotics including anti-depressants, tranquillizers and anti-anxiety drugs. Amphetamine group is also missing in the chapter on CNS stimulants. The chapter on narcotic analgesics omits even a mention of etheno-morphines, endorphins and enkephalins. Anti-diabetic drugs, anti-thyroids and diagnostic agents are all part of medicinal chemistry curriculum, but do not find place in this book. A very large group of chemotherapeutic agents like anti-bacterials, tuberculo-

and leprostatics, anthelmintics, anti-protozoals (other than anti-malarials), anti-cancer agents, anti-viral drugs are totally abandoned. These are very much relevant to the tropical countries. Even among the antibiotics, cephalosporins, macrolides, antifungal and anti-cancer antibiotics and quinolones are glaringly missing. In contrast to this, many drugs not included in any Pharmacopoeia (many obsolete and some still to be accepted) are found in all chapters, including their syntheses. While the author has included INN, USAN and BAN designations (not very useful information!), the information about official status in the Indian Pharmacopoeia is extremely unreliable. Many Indian Pharmacopoeia drugs are not included or designated as such and several drugs which are not official in Indian Pharmacopoeia are actually shown as Indian Pharmacopoeia drugs. For a book on medicinal chemistry omission of properties like crystalline nature, mol. wt., solubility, pharmacopoeial forms (e.g. different salts official), limits for specific impurities present due to synthetic routes, basis of assays, etc., is not desirable. Students and teachers depend on textbooks for authentic and collated information on a given drug or topic. There is also no mention made of the importance and relative activities of isomers (stereo-chemical, optical, geometrical, etc.), even when these are very relevant. The literature cited is inadequate and repetitive. The index is cursory and inadequate.

The price is rather high for the Indian scene. The Indian editions of 'Foye', 'Wilson & Gisvold' and 'Atherden' are much cheaper and very superior. It is surprising that a reputed publisher like Wiley Eastern should have paid little attention to the quality of the subject as also to the production. In its present form the *Medicinal Chemistry* by Ashutosh Kar is not useful to students and teachers of medicinal chemistry, much less to practising/manufacturing pharmacists. I am afraid I cannot recommend it to any library also for fear that the errors in the book might get into classrooms through inexperienced teachers and become part of the disinformation a student may acquire.

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The Business of Living: An Acquaintance with Biology. Sandhya Mitra. Wiley Eastern Ltd., 4835/24, Ansari Road, Daryaganj, New Delhi 110 002. 1992. 356 pp.

Though the phenomenon of life remains one of the most challenging enigmas of nature, teaching biology in schools and colleges in India remains less exciting than a peep into the port or starboard deck of Noah's Ark. Rather than presenting the thrill and excitement of the intricacies of the life process, in most cases, biology curriculum in the country remains merely a catalogue of life-forms. Any effort to rectify the situation will involve the availability of good textbooks, particularly indigenous, which can serve as the link between the lab bench and the classroom. But most of the textbooks currently available hardly ever deviate from the standard approach of presenting the 'Parade of Life-forms'. Even the pictures are so stereotyped, many books even use the same printing blocks! In this context, Sandhya Mitra's efforts to present an integrated view of biology to cover the entire spectrum of biological research is commendable. In writing the book *The Business of Living: An Acquaintance with Biology*, she attempts to present a good textbook which can serve as a backdrop for an introductory biology course. Though the effort is laudable, the final product falls short of expectation. The book could do with a lot of improvements particularly the early and late chapters.

The major stumbling block is lucidity. In many sections, though the title is appealing, it fails to convey what the author intends. A good example is the first chapter itself which is supposed to give a historical survey of the evolution of major concepts in biology. Most of the chapter is irrelevant to biology. At the same time, the history of emergence of major concepts such as heredity is not given sufficient attention.

In an attempt to be dramatic, Mitra makes innumerable factual errors. In her introduction to Dalton's atomic theory, she states 'Atoms were proposed to be the ultimate discrete units of matter that could be interconverted to energy and vice versa' (page 19). Dalton has apparently preempted Einstein! To state that 'This knowledge became the founda-