markable changes that have taken place in understanding chemical substances that are important in the central nervous system over the past ten years. Cannon's review on "Structure–Activity Relationships of Dopamine Agonists" is well illustrated with chemical formulas, which is an important aid in following the discussion. The chapter on "Recent Developments in Mass Spectrometry for the Analysis of Complex Mixtures" provides some very basic and informative material on how the new techniques in this area are being used. The volume provides a number of other very timely reviews; they seem to be well written and could provide the reader with some initial leads to more in-depth studies that have been carried out.

The indexing for the volume is very complete, both by author and subject, for rapid access to the desired material. Each of the reviews ends with a Conclusion or Summary section which distills each review to some very basic points and areas of interest for the future.

Because of the nature of the series, this would be a good volume to have present in the library so that individuals could easily read a review in one of the areas covered. I would recommend that the volume be acquired for a School of Pharmacy library or Health Science library or in a general reading room facility for faculty and graduate students. The volume provides a valuable resource for a reasonable cost, in that the authors of the various sections have provided good coverage of findings that have taken place in recent years in pharmacology and toxicology.

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FREE RADICALS AND CANCER. Edited by ROBERT A. FLOYD. Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016. 1982. 541 pp. 16 × 23.5 mm. Price $69.75 (20% higher outside the U.S. and Canada).

The role of free radicals in cancer development has been of concern to, and studied by, many investigators in the past three decades. Up to the present, however, there is as yet no clear-cut settlement of this seemingly simple but actually complicated problem and probably there never will be. This is perhaps one of the main reasons that the editor is compiling the thoughts of many investigators from all over the world into one volume.

Thirteen groups of researchers contributed their findings and interpretations. These include (titles abbreviated): C. Nagata *et al.* (Free Radicals from Chemical Carcinogens and Significance in Carcinogenesis) from Japan; [illegible] *et al.* (Nitroxide Metabolism in Liver Microsomes) from the Federal Republic of Germany; H. M. Swartz (ESR Studies of Cancer) of Illinois; E. Cavalieri *et al.* (Multiple Activation Mechanisms in Aromatic Hydrocarbon Carcinogenesis) of Nebraska; A. M. Bobst (Spin Bioassays with Nucleic Acids) of Ohio; J. Cadet and R. Téoule (Binding of Radiosensitizing Drugs to DNA) from France; F. R. DeRubertis and P. A. Craven (Activation of Guanylate Cyclase and Evidence for a Free Radical Mechanism) of Pennsylvania; N. M. Emanuel (Free Radicals and Growth of Tumors) from the U.S.S.R.; R. Sridhar (Radiation Sensitizers in Therapy) of Oklahoma; R. A. Floyd (Free Radicals and Arylamine Carcinogenesis) of Oklahoma; E. G. Janzen and E. R. Davis (Detection of Free Radicals by Spin-Trapping) from Canada; J. A. Hinson *et al.* (Role of Free Radicals in the Mutagenicity of *N*-Hydroxy-2-acetylaminofluorene) of Maryland; and J. E. Biaglow *et al.* (Metabolic Activation of Carcinogenic Nitro Compounds to Oxygen-Reactive Intermediates) from the U.S. and Canada. It is probably unavoidable that writings which came from such a variety of sources would contain material with duplicate or even contradictory information. Actually this is perhaps a clever way to inform the readers of the vastness and the uncertainties of this field of study.

Aside from the key question raised at the beginning of this review, there are other points that deserve to be mentioned. Although free radicals have been detected in many carcinogens with or without enzymatic action, they have also been detected in normal and pathological tissues. Throughout this book it is reported that even some compounds possessing recognized antineoplastic action, such as doxorubicin hydrochloride (Adriamycin), or prophylactic property against cancer information, such as ascorbic acid, produce free radicals in ESR measurements. To make the situation even more complicated, some carcinogens do not produce free radicals. Free radicals generally are defined as species having ESR signals in the g = 2.00 region with line shapes and power-saturation characteristics typical of organic free radicals (the latter exclude paramagnetic metals). However, measurement of free radicals depends on a number of variable experimental conditions, including the preparation of samples, the temperature during measurement, the solvent used, the type of tissue examined, and animal species differences. Therefore, one should be extremely careful and cautious in making empirical and qualitative correlations and straightforward interpretations.

The relationship of free radicals to cancer can perhaps be approached in another aspect. That is, to study the quantitative rather than the qualitative characteristics of free radicals in certain types of cancer detection, diagnosis, and response to treatment. There are already indications in this book that an in-depth study of ESR signals may reveal characteristic information in the development and progression of certain types of tumors and tumor response to therapeutic treatment. Studies along this line should be extremely useful in cancer research.

After reading all of the material presented in this book, one may assume that free radical formation may well be just a phenomenon observed during the cellular proliferation (rather than limited to only during the cancer growth) or a phenomenon observed as formation of intermediates during metabolic activation of many chemical compounds (not necessarily limited to mutagens, carcinogens, or antineoplastic agents). The situation is analogous to that of the numerous studies on drug–DNA intercalation: that the observed phenomenon may not be the real, or the major, or even the minor, mode of biological action.

This book is recommended to those scientists who are interested in these aspects of biology and medicine, as well as to oncologists and physicians who are forever searching for the fundamental knowledge of the secret of life.

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Current Trends in Organic Synthesis. Proceedings of the Fourth International Conference on Organic Synthesis. Edited by HITOSI NOZAKI. Pergamon Press, Maxwell House, Fairview Park, Elmsford, NY 10523. 1983. 429 pp. 18.5 × 27.5 cm. Price $90.00 (£45.00).

The 30 lectures compiled from the talks presented at the 1982 IUPAC meeting in Tokyo (August 1982) constitute an impressive review of the current state of the art in the field of organic synthesis. Because the book is a reproduction of the authors' manuscripts, there are a few typographical errors and unclear figures, but these minor shortcomings in no way detract from the overall appeal of this volume. As outlined in the Preface, the book is divided into four areas: synthesis of natural products, methods for achieving stereoselectivity, new synthetic methodology, and new reactions.

The group of lectures on natural product synthesis begins with a presentation by E. J. Corey on his work in the leukotriene field, which includes synthetic methodology developed for use in this area, but with applications throughout organic synthesis, as well as total syntheses of LTB and several rationally designed inhibitors of lipoxygenase enzymes. The next lecture, by W. Bartmann, discusses the synthesis of stable analogues of PGI2, illustrating the intimate connection between chemical synthesis, biological testing, and development of commercially feasible syntheses characteristic of industry. C. Heathcock then describes the efforts of his group in the area of stereoselective aldol condensation reactions and their application to his ongoing total synthesis of erythromycin. B. M. Trost outlines the observations that lead to the development of the total synthesis of verrucarol as well as continuing work on its elaboration to verrucarin A. A review of the numerous examples of the Diels–Alder reaction developed by the group of M. E. Jung and their application to steroid and anthracycline natural products is offered next. Highly selective protecting group chemistry is the focus of a lecture by C. B. Reese on the total synthesis of yeast alanine tRNA, a nonadecaribonucleotide. W. Nagata presents the work that led to the first industrially feasible synthesis of a 1-oxacephem, illustrating the multiplicity of routes attempted and new methodology that had to be developed along

the way. S. Wolfe's lecture shows how an academic laboratory can branch out into exploration of combining chemical with enzymatic reactions to fashion new and important compounds in the β-lactam field, including the commercial product ceftizoxime. Finally, Y. Kishi discusses his group's efforts toward the determination of the stereochemistry of the *entire palytoxin* molecule, mentioning numerous synthetic methods developed in the pursuit of this gargantuan task.

The next group of lectures discusses the development of methodology for achieving stereoselectivity in synthetic reactions. W. Oppolzer begins by describing his work using chiral precursors to direct carbon–carbon bond-forming reactions and his exploitation of the metallo-ene reaction to construct complex carbon skeletons. D. Enders continues with a discussion of his work on the use of metallated chiral hydrazones to form carbon–carbon bonds with high stereoselectivity. Y. Ito next illustrates applications of the intramolecular Diels–Alder reaction of *o*-quinodimethanes to the construction of steroidal and alkaloidal skeletons. G. Posner discusses his results in stereoselective carbon–carbon bond formation *via* conjugate addition of Grignard reagents to chiral 2-sulfinylcycloalkenones. P. Bartlett shows the potential of his iodolactonization chemistry for controlling the stereochemistry along a carbon chain. An elegant stereocontrolled synthesis of the side chains of two vitamin D3 metabolites *via* remote asymmetric induction during a nitrone cycloaddition reaction is presented next by M. Uskokovic. B. Fraser-Reid then discusses his progress toward the ansa chain of rifamycin starting from readily available chiral precursors. S. Hanessian continues this theme of chiral templates with an in-depth look at the strategy and chemistry he is employing in an assault on boromycin. E. Vedejs next discusses the importance of local conformational effects which he has used in conjunction with his sulfur-mediated ring expansion strategy to approach erythronolide. Finally, W. C. Still illustrates his application of molecular mechanics calculations to the determination of macrocycle conformations with the syntheses of eucannibinolide and rosaramicin.

Nine lectures demonstrate the role of organometallic reagents in the development of new synthetic methodology. H. C. Brown provides a thorough review and update on hydroborating reagents which can achieve remarkable chemical selectivity. E. Negishi next discusses the allylation and vinylation of organometallics, especially metal enolates, *via* nickel and palladium catalysis. H. Yamamoto shows how oxime sulfonates can be used with organoaluminum reagents to provide α-alkylated amines or as precursors for intramolecular cyclization to interesting heterocycles. Additions of organometallic reagents to acetylenes and vinyl halides for the preparation of conjugated dienes is the theme of a lecture by J. Normant. M. Semmelhack next illustrates some interesting applications of nickel and chromium chemistry to the synthesis of quinone natural products. I. Kuwajima discusses several features of his trimethylsilyl enol ether chemistry culminating in a synthesis of showdomycin. The preparation and functionalization of various heterocyclic systems by using the trimethylsilyl group for activation is presented by H. Vorbruggen. The array of functionality available from the ring-opening reactions of cyclopropanes generated by the addition of carbenes to silyl enol ethers is outlined by J. Conia. Finally, M. Mikolajczyk demonstrates the utility of sulfur-substituted Wittig reagents for the formation of five-membered ring systems.

The last group of lectures describes much new chemistry which should see widespread application in future synthetic work. G. Stork begins by presenting his recent work on radical cyclization reactions, stressing the power of his methodology for generating pentacyclic systems. H. Musso next discusses rules governing the direction of hydrogenolytic cleavage of cyclopropane bonds. E. Vogel reviews the chemistry developed in the pursuit of various novel annulene structures. M. Makosza demonstrates the versatility of nitroarene substitution reactions by carbanions containing a leaving group at the carbanionic site for the construction of various aromatic and heteroaromatic systems. Finally, D. J. Sam concludes by outlining the potential of dichlorine monoxide as a powerful yet selective chlorinating reagent.

While much of the above material has appeared in print since this meeting was held, readers will still find this book a useful compendium of the work currently being pursued at the frontiers of organic synthesis. It may thus be useful to students as an introduction and overview of the field and to long-time practitioners of the art of synthesis as a review and indication of trends for the future. It is a worthwhile investment for both academic and industrial chemistry libraries.

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NOTICES

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