BOOK REVIEWS

Applications of Nuclear Magnetic Resonance Spectroscopy in Organic Chemistry. By L. M. Jackman, Lecturer in Organic Chemistry, Imperial College of Science and Technology, London. Pergamon Press, Inc., 122 East 55th Street, New York 22, N. Y. 1959. xii + 134 pp. 17 × 24.5 cm. Price, $5.50.

Of the four published books on nuclear magnetic resonance (NMR) spectroscopy of particular interest to chemists, the present volume is clearly the best for a practicing organic chemist to use when confronted with the problem of interpreting a NMR spectrum of one of his products. The coverage of chemical shifts and representative spin–spin coupling situations is about as thorough as could possibly be expected in 80 pages and is clearly and interestingly presented. A considerable number of typical and important spectral problems are analyzed. The presentations of the underlying physical principles are generally brief and may not provide a novice in the field with much understanding of the basic nature of NMR phenomena.

In the opinion of the reviewer, a definitive exposition of spin–spin splitting for organic chemists is yet to be published. The fundamental contribution to the analysis of spin–spin multiplets made by McConnell, MacLean and Reilly [*J. Chem. Phys.*, **23**, 1152 (1955)] was directed to specialists in molecular spectroscopy, and later restatements by others are similarly beyond the grasp of the average organic chemist. The discussion in the present volume is based on the notation and procedures of Pople, Schneider and Bernstein (collected and summarized in "High-Resolution Nuclear Magnetic Resonance," McGraw-Hill Book Co., Inc., 1959) and is purely descriptive, no effort being made to show the mathematical relationships between coupling constants, magnetic shieldings, transition energies and transition probabilities. This can be unfortunate, as in the discussion of the ABX case on pp. 90–91, where it is going to be hard to see how A can ever appear to split X if J_{AX} is negligibly small. Matters might have been helped considerably by noting that (when $\delta_A \sim \delta_B$) if A and B are more tightly coupled to each other than each is to X, then A and B act as though they are equally coupled to X even if $J_{BX} >> J_{AX}$. Hopefully, a treatise on spin–spin splitting will some time be written for organic chemists using reasonably familiar words and mathematics which will give a clear understanding of how transition energies and probabilities can be calculated.

The present volume is very attractively printed and illustrated, but contains a fair number of typographical errors. It is highly recommended to organic chemists interested in the qualitative interpretation of NMR spectra.

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Toxic Aliphatic Fluorine Compounds. By F. L. M. Pattison, M. A., Ph.D., F.R.I.C., F.C.I.C., Professor and Head, Department of Chemistry, University of Western Ontario, London, Ontario, Canada. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1959. xi + 227 pp. 13 × 19 cm. Price, $3.50.

This valuable little book begins with the familiar quotations, "Mordre wol out," and "In poison there is physic." In the past the naturally occurring ω-fluoroacetates and derivatives were perfect poisons. They were stable, inoffensive and had a delayed action, but finally caused convulsions, paralysis and death, with no known antidote available, leaving behind no identifiable residue. However, modern research has clearly revealed the mode of action of these poisons, antidotes have been found, and accurate methods for determining fluorine have become available. It has also been found possible to use these poisons as tags in animals to verify or predict metabolic pathways, knowledge which may ultimately benefit humans.

The first chapter presents a broad survey of the material to be considered later on. Most important, perhaps, is the description of the alternating toxicities of the ω-fluorocarboxylic acids on ascending the homologous series, indicating that they are degraded *in vivo* by β-oxidation. Only the even numbered members of the series can be thus degraded to monofluoroacetic acid, which is therefore the actual toxic species in all cases.

The second chapter gives in detail the history, preparation, properties, toxicology, pharmacology, biochemistry and medical aspects of the simple monofluoroacetates and derivatives. It has been found that monofluoroacetic acid mimics acetic acid in the animal organism by combining with coenzyme A and so entering into the tricarboxylic acid cycle to form fluorocitric acid, which then inhibits the enzyme aconitase, thus effectively blocking the oxidative cycle. This results in loss of energy, accumulation of citric acid in the tissues and ultimate death.

Next we find a similar description of the occurrence, chemistry and toxicology of the long chain ω-fluorocarboxylic acids and derivatives, and their degradation by β-oxidation. Incidentally, an African plant containing ω-fluoro-oleic acid was long used by the natives to poison both their enemies and animals (ratsbane), thus anticipating the modern commercial use of sodium fluoroacetate as a rodenticide.

Then there are listed series of ω-fluoro alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, nitriles, and many others, all showing alternating toxicities, some even greater than that of fluoroacetic acid. These alternating toxicities may be used as a tag to determine the fate of a functional group *in vivo*. Nitriles containing an odd number of carbon atoms are toxic, thus confirming the known theory that nitriles *in vivo* do not yield corresponding carboxylic acids, but undergo α-oxidation with the loss of hydrogen cyanide. Also, many polyfluoro alkenes are highly toxic, and even the vapor from overheated Teflon can be dangerous.

The final chapter discusses potential uses and applications. Of these the use of sodium fluoroacetate (*compound 1080*) as a rodenticide, fluothane ($CF_3CHClBr$) as a non-explosive anesthetic, and fluoroacetamide as a systemic insecticide for non-edible plants, are the most important. Many other possible uses are described.

This volume, the first of a forthcoming series, is well organized (6 figures, 31 tables, some extensive), well documented (over 400 references), and well printed with a minimum of errors. It also contains a succinct summary and four appendices, dealing with chemical properties, preparations, first-aid treatment and a special bibliography of informative articles.

This valuable reference book by a competent author should be on the active reading list of every fluorine chemist, either in research or production: in the best interests of safety, and of a better understanding of biological problems.

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Chromatographic Reviews. Progress in Chromatography, Electrophoresis and Related Methods. Volume 2. Edited by Michael Lederer, Institut du Radium, Arcueil (Seine), France. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1960. viii + 195 pp. 17 × 24 cm. Price, $9.00.

Last year M. Lederer, the editor of the "Journal of Chromatography," introduced the practice of republishing the review articles from his periodical in book form. The summaries in French and German were translated into English. This publication represents a continuation of that policy. It contains six articles, amply illustrated and documented by experienced investigators, plus a subject index. Gas-liquid chromatography is reviewed by C. J. Hardy and F. H. Pollard (43 pp., 619 refs.); starch block electrophoresis by H. Bloemendahl (16 pp., 62 refs.); paper