been prohibitively expensive, as there are more than 5300 references to the original literature.

The book is useful in those ways in which any fine monograph is useful. It pulls together a vast body of information scattered through the world's literature, chemical and botanical. Even the specialist who works only with members of a few alkaloidal families will probably not have read all the difficultly accessible journals from which the reports of this volume are drawn. Not only are the original citations given, but reference is made to the abstract either in "Chemical Abstracts" or "Chemisches Zentralblatt." Thus this book will be a useful addition to his reference shelf. The introduction to each class of substances includes a brief presentation of the biogenetic theories advanced to account for the structures of the principal members. These theories are not discussed in any critical fashion, although admittedly the experimental evidence on which sound criticism may be based is only now beginning to be published in quantity. The book does not include description of the pharmacological action of the various substances, but seems otherwise remarkably complete.

Two minor criticisms may be made of the work: The more serious is that it is not particularly critical of the material included. To cite but a single example, the reported syntheses of apoyohimbine and yohimbine from yohimbone by Preobrashenskii, *et al.*, are presented without comment, although the syntheses are implausible both from a mechanistic point of view and from the poor correspondence between the reported properties of the synthetic and natural substances. A less serious criticism is concerned with an aspect of the format. The stereochemistry of the majority of the substances discussed is known. Unfortunately, much of their chemistry is presented with formulae lacking this known stereochemistry. Toward the end of a particular section the stereochemistry is given; then one must go back and reread the transformations to see how their course is made the more plausible by the additional knowledge.

With the single exception mentioned above, the format is excellent. In quality of paper, printing and binding, the volume approaches that offered by the Swiss publishers, though it does not achieve it. There are a number of typographical errors, the majority of which are cited and corrected in the unbound supplement. Though it is quite expensive, this work is less expensive than recently available sets on the chemistry of alkaloids and much more complete, and is to be recommended.

DEPARTMENT OF CHEMISTRY
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Collection of Problems in Physical Chemistry. By JIŘÍ BAREŠ, ČESTMIR ČERNÝ, VOJTĚCH FRIED and JIŘÍ PICK. Translated by HELENA WATNEY. Addison-Wesley Publishing Company, Inc., Reading, Massachusetts. 1962. xvii + 608 pp. 16.5 × 23.5 cm. Price, $9.75.

Until some twenty-five years ago no collection of numerical problems in physical chemistry was available that was not based on experiment and theory at least twenty years behind the advancing frontier of the science. It is gratifying to note that the past ten years has seen the appearance of at least three further collections of problems. They vary in form and emphasis; some hope to lure the student into reading the paper from which the data are taken and others clearly attach little importance to this fringe benefit; all recognize and to varying degrees satisfy the need for problems related to areas of current research interest.

The volume under review comes from four members of the faculty of the Institute of Chemical Technology in Prague; it is a welcome addition to the growing family of problem collections. It is at least as comprehensive as any of its predecessors; it includes almost all areas of physical chemistry. Each of eleven chapters covers a region of the subject and consists of a number of worked examples followed by a set of unworked problems with their numerical answers. Some but by no means all of the unworked problems are accompanied by literature references; the latter include a good many from journals written in English. It should perhaps be added that in some chapters the unworked problems include some rather pedestrian calculations; an extreme example of this is provided by the inclusion of three routine Beer's law calculations in the total of fourteen unworked problems in the chapter on "Molecular Structure and Physical Properties."

The price of the book is probably too high for general student purchase, but it is to be noted that its length is greater than that of other collections and the typographical format is generous and appealing. The number of worked illustrations is around two hundred and the number of unworked problems is over four hundred. Certainly no teacher of physical chemistry would find it other than a rewarding investment and a useful teaching tool.

DEPARTMENT OF CHEMISTRY
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The Chemical Basis of Carcinogenic Activity. By G. M. BADGER, Ph.D., D. Sc., Professor of Organic Chemistry, University of Adelaide, Adelaide, South Australia. Charles C Thomas, Publisher, 301-327 East Lawrence Avenue, Springfield, Illinois. 1962. xiii + 72 pp. 6 × 23.5 cm. Price, $5.00.

This book, by one of the leading contributors to organic chemical research in carcinogenesis, is a useful and up-to-date reference source for the carcinogenic activity of chemical compounds. In keeping with the spirit of the "Living Chemistry Series," the book is neither long nor encyclopedic. The style of writing is clear, concise, and quite readable. Although the references are not profuse (numbering 157 in all), they are useful and, for the most part, well selected; key references will allow the interested reader to investigate further.

Beginning with the suggestion by Pott in 1775 that constant exposure to soot was responsible for the development of skin cancer in chimney sweeps, the author classifies the important chemical compounds now known to be carcinogenic in animals or in man. The major categories include polycyclic aromatic hydrocarbons, aromatic amines and azo compounds; carcinogenic activity has also been demonstrated for alkylating agents, urethanes, *Senecio* alkaloids, steroids, inorganic compounds, polymers and a number of miscellaneous compounds that defy classification in structural groups. In fact, the variety of chemical structural types producing tumors in animals is nothing short of bewildering.

Dr. Badger discusses not only the historical background, chemistry and structures of chemical carcinogens but also the metabolism and postulated mechanisms of chemical carcinogenic action, wherever possible, and he includes a brief discussion of *in vivo* bioassay techniques for the evaluation of carcinogenic activity. He appropriately restricts his structure–carcinogenic activity correlations to related compounds of a given structural type, and emphasizes the impossibility of delineating a single structural configuration or moiety that is generally responsible for carcinogenic activity. By the same token, a single mechanism of action for carcinogenic compounds in general is highly improbable; on the other hand, it is equally unlikely that a separate and distinct mode of action will be found for each of the several hundred chemical carcinogens now known. It is regrettable that very little substantial information on the mechanism or mechanisms of chemical carcinogenesis has been derived from the extensive studies carried out to date on the metabolism, biochemistry and experimental pathology of carcinogenic agents.

The author discusses the two-stage mechanism theory of carcinogenesis involving an initiation phase, in which normal cells are altered, and a promotion phase, in which the altered cells can be recognized as malignant. He also reviews the observations on the binding of certain carcinogens to cell proteins as related to possible mechanisms of carcinogenesis.

The book can be criticized only in that it is too brief and superficial to be of any real value to the investigator in the field of chemical carcinogenesis. For example, the work of the Pullmans, Coulson, and others on the attempted correlation of electron densities at the K and L regions of polycyclic aromatic hydrocarbons with carcinogenic potency is inadequately and only indirectly mentioned. However, the book is recommended for the non-specialist, especially those desiring an introduction to chemical carcinogenesis.

It should be pointed out that, with few exceptions, compounds known to be carcinogenic in animals have not been unequivocally proved to be carcinogenic in man. The author takes the conservative and eminently reasonable position that any compound carcinogenic in animals should be regarded as potentially carcinogenic in man. This somewhat controversial subject is of great importance at the moment in the evaluation of the potential carcinogenic activity in man of chemical substances that will come into physical contact, either internally or externally, with human beings. Dr. Badger's philosophy is summed up in his closing sentences: " . . . all the different carcinogens are worthy of study. Such studies can not only point to potential human hazards, but may be of the utmost value in providing some understanding of the mechanism of carcinogenesis."

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Physical Aids to the Organic Chemist. By M. ST. C. FLETT, Research Chemist, I. C. I. (Dyestuffs Division) LTD., Blackley, Manchester, Great Britain). American Elsevier Publishing Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. 1962. 388 pp. 13.5 × 19.5 cm. Price, $8.00.

This book is on the whole well written and free of typographical errors. The book contains chapters on Chromatographic Separation, Gas–Liquid Chromatography, Zone Refining, Electronic Absorption Spectroscopy, Infra-Red Spectroscopy, Electron

Spin Resonance Spectroscopy, Nuclear Spin Resonance Spectroscopy, Mass Spectrometry and X-Ray Crystallography. About 40% of the book is concerned with the chapters on Electron Absorption Spectroscopy and Infra-Red Spectroscopy.

The book is directed toward "students and practicing organic chemists who wish to expand their knowledge of [physical] methods." There is a serious doubt in this reviewer's mind whether this book achieves this end. The book's approach to the above topics is very qualitative. Granted, students and practicing chemists can be easily discouraged by an excess of theory for theory's sake. At the same time an author runs a serious risk of non-rigorous expression by too drastic elimination of the theoretical basis of his subject. For example, in choosing not to pursue quantitatively the relationships between e.s.r. hyperfine splittings, spin density distributions and models for nucleus–electron interactions in paramagnetic systems, the author fails to acquaint the reader with one of the most powerful approaches to the elucidation of the electronic and geometrical structures of molecules. It is true that more quantitative treatments of each physical technique are to be found in the excellent lists of references at the end of each chapter. But, then, qualitative introductions to each topic are to be found also in the references cited.

A few errors were noted. The statement, page 146, "... if there are no coincidences between the infra-red and Raman frequencies of an unknown structure, it cannot have a center of symmetry." is incorrect. On page 236, the statement concerning the distribution of electrons between $m = {}^1/_2$ and $m = -{}^1/_2$ states in a saturating RF field is incorrect. It is not true as stated on page 236 that in all cases the line width in e.s.r. spectroscopy"... is inversely proportional to the lifetime of an absorbing species in its excited state."

This book possibly has a place in undergraduate libraries as a first introduction to physical techniques in organic chemistry. Because of the reasons cited above, a more favorable recommendation cannot be extended.

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