ride. Purification by crystallization from methanol-ether and then methanol gave material of m.p. 280–287° dec. *Anal.* Calcd. for $C_{22}H_{28}O_2N_2\cdot 2HCl$: C, 62.12; H, 7.11; N, 6.59. Found: C, 61.97; H, 6.97; N, 6.71. Determination of *pK*a values in aqueous ethanol gave values of 3.7 and 7.5. Absorption measurements in the ultraviolet at *p*H 7 gave $\lambda_{\max}^{CH_3OH}$ 2350Å., *E*% 293; 2890Å., *E*% 34.5. Treatment of the free base (I, m.p. 83°) with acetic anhydride-acetic acid at 90–100° and conversion to the salt gave the N-acetyl monohydrochloride, m.p. 264–265°; *Anal.* Calcd. for $C_{24}H_{30}O_3N_2\cdot HCl$: C, 66.88; H, 7.25; N, 6.50. Found: C, 67.18; H, 7.57; N, 6.39.

Ethyl 1-(4-aminophenethyl)-4-phenylisonipecotate is a potent analgesic with high oral activity and relatively mild side reactions. Mild anti-acetylcholine and antihistaminic activity has been observed in both isolated organs and in intact animals. In animals, the compound approaches morphine in analgesic potency and is several times more active than meperidine (ethyl 1-methyl-4-phenylisonipecotate). Unlike meperidine, it is a good antitussive agent against experimental cough in guinea pigs and dogs.

The side reactions in animals such as general depression and sedation, depression of respiration and lowering of blood pressure, are considerably milder than those produced by morphine, and somewhat milder than those of meperidine. The new compound does not produce nausea, vomiting or constipation in animals.

The acute oral and subcutaneous toxicity of the compound, as measured in mice, is of the same order as meperidine, but it is somewhat more toxic on intravenous administration.

After subcutaneous injection into rats, a bound form, probably the N-acetyl derivative, was found in the tissues. The synthetic N-acetyl derivative has analgesic activity of the same order as the parent compound when tested in rats.

Ethyl 1-(4-aminophenethyl)-4-phenylisonipecotate has been given the generic name anileridine. Preliminary results in man by oral and parenteral administration indicate an analgesic potency at least twice that of meperidine.

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BOOK REVIEWS

An Introduction to Paper Electrophoresis and Related Methods. By MICHAEL LEDERER, Institut du Radium Paris. Elsevier Publishing Company, 2330 Holcombe Boulevard, Houston, Texas. 1955. xii + 206 pp. 16 × 23.5 cm. Price, $7.75.

For those investigators who are not familiar with the field of electrophoresis and who are interested in applying the new and simple procedures on filter paper to a specialized problem, this is a very welcome book. There are certainly many people in such a category because of the widespread applications ranging from the separation of isotopes to the classification of blood proteins in human disease. This broad range of subjects is well covered in Doctor Lederer's book and it is apparent that he has had a long and diversified experience in this field. The book is written in a clear and simple manner supplemented by many illustrations and is easily read by the novice. In addition, there is sufficient theoretical background along with a very complete and extensive bibliography to make it a useful volume to experienced workers. One might wish that the author had been more critical of the various procedures for carrying out paper electrophoresis, particularly in view of his own experience, so that the reader could better evaluate the method that he should apply. This is a most difficult problem because all the techniques of paper electrophoresis work fairly well and no one unbiased observer has had sufficient experience with the whole group to really classify them.

A relatively small portion of the book is devoted to electrophoresis in other supporting media besides filter paper. The section on gels is quite complete but this whole subject is developing so rapidly at the present time that any attempt at a review is almost immediately outdated.

Despite these natural limitations, this work should be a valuable addition to any laboratory applying or interested in applying electrophoretic methods.

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HENRY G. KUNKEL

Basic Processes of Gaseous Electronics. BY LEONARD B. LOEB. University of California Press, Berkeley 4, California. 1955. xvii + 1012 pp. 16 × 24.5 cm. Price, $13.50

In the first edition of his classic "Conduction of Electricity through Gases" (1903), J. J. Thomson wrote:

> With the discovery and study of Cathode rays, Röntgen rays and Radio-activity a new era has begun in Physics, in which the electrical properties of gases have played and will play a most important part. . .

Nearly a half-century later, however, H. D. Smyth (writing in the *American Scientist* in 1947), after affirming the origin of many great discoveries of the modern period of physics in studies of discharges in gases, remarks that:

> the innumerable series [of experiments] on the discharge of electricity through gases. . .has been going on now for nearly a hundred years, has given us the fluorescent lamp and other devices, but has still not told us what happens in an electrical discharge in gases.

The truth of this melancholy observation is amply attested in L. B. Loeb's most recent book, a dishearteningly massive tome which may quickly give mental indigestion to any but the most expert and tenacious reader. Although great progress has certainly been achieved—thus, contemporary techniques in electronics have, just in the past decade, virtually revolutionized the experimental approach, and greatly enhanced the accessibility of many long-studied phenomena—the analysis of numerous important aspects of gaseous conduction still ends in a bewildering morass of complexity.

"Gaseous electronics," incidentally, is the apt designation used to replace "electrical discharges in gases" in this triumphant modern era. The plan of the book is separately to treat various basic phenomena which are important in gaseous conduction, such as drift velocity, diffusion and recombination of charge carriers, and only then to deal with the properties of discharges themselves. The division of topics in numbers of pages is, approximately: ion mobility 180, electron mobility 60, diffusion 30, formation of negative ions 100, recombination 120, electron-energy distributions 110; and then conduction below ionization by collision 50, and conduction above ionization by collision (the Townsend coefficients) 320. The emphases in this assignment obviously, and properly, reflect the author's own interests. A tremendous amount of detailed information is included, and the literature coverage must surely be almost exhaustive.

Each topic is introduced by a comparatively simple development which is intended to lead the reader easily to the detailed discussions. Indeed, advertising for the volume claims it to be "readily intelligible to any reader with a knowledge of basic atomic structure and relatively little kinetic theory," but this is a great exaggeration, in the reviewer's opinion; the introductions do not always bridge the gaps, and even where they do the level of sophistication and the store of factual knowledge assumed in the reader fluctuate widely and erratically. This should rule against its use as a textbook. So also should the circumstance that coherence and consistency are not conspicuous—and this refers to terminology and nomenclature as well as to logical development.

It should not be inferred from the words "basic processes" in the title that the important elementary events occurring in gaseous discharges are analyzed in a comprehensive and realistic manner. Thus, to cite two examples, there is no systematic treatment of excitation and ionization cross-sections for electrons, and these fundamental quantities are only alluded to cursorily; and the Ramsauer effect is not discussed as such, nor is the quantum theory of this effect adequately explained. Indeed, not only the results, but even the concepts of the quantum mechanics of collision processes are missing, whereas much space is accorded classical theories based upon obsolete models.

The book has a highly personal flavor, which the reviewer found attractive, but it is written in a style which is pedestrian and diffuse, and often distressingly discursive. The type and composition are such as to give a monotonous, unappealing appearance to the page. There are numerous errors, typographical and otherwise.

These criticisms do not deny the great importance of this work for reference, for it does contain a vast amount of valuable information, much of which is not readily available elsewhere. It will be a useful book.

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Resonance in Organic Chemistry. BY GEORGE WILLARD WHELAND, Professor of Chemistry, University of Chicago. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N.Y. 1955. xiii + 846 pp. 15 × 23.5 cm. Price, $15.00.

Revisions of books tend to be like model changes in automobiles and it is customary after the all-out new design to revise by addition of new chromium to the front and more intricate tail lamps to the rear. Seldom does one find a model change so drastic that it might be likened to the transfer of radiator cap, horn and steering wheel from a sporty Stutz Bearcat to a Fruehauf truck-trailer combination. Lest this analogy seem farfetched in connection with Professor Wheland's new book, the reviewer hastens to point out that here is a revision with a 270% expansion in number of pages, a 305% increase in mass, and even a new title on the cover. Three volumes are combined into one. First is a thorough-going revision and amplification of the author's "The Theory of Resonance and Its Application to Organic Chemistry," then comes a 150 page treatise on the mathematical basis of resonance and, finally, there is a 115 page appendix listing some 6000 experimentally determined bond distances, and a comparable number of bond angles as gleaned from over 500 references.

Customer complaints were obviously given careful consideration in the preparation of the revision, including those from the disciples of Butlerov. The semantics of resonance are extraordinarily carefully considered although the admirable clarity of the first twelve pages seems to some extent nullified by the manner of presentation of "The Conditions for Resonance" in the subsequent section. A new feature is an elementary presentation of molecular orbital theory. However, there is no concise and definite comparison of the relative advantages and disadvantages of the molecular orbital approach as compared to the resonance method in qualitative applications to the various theoretical problems of current interest.

Another welcome addition is a section on the general theory of aromatic systems which includes an interesting discussion of the cyclobutadiene and pentalene problems. The section on molecular spectra has been very thoroughly revised and now provides an introduction to electronic spectra which should be required reading for every organic graduate student Many new data are also supplied for chapters on equilibria and reaction rates. Here the author steers an admirably careful course in showing how the resonance method can be of general utility in predicting the rates and products of organic reactions with the aid of somewhat over-simplified reaction mechanisms, without getting bogged down in the details of how the over-simplified mechanisms are at variance with experimental data for particular examples, as in his discussion of proton-initiated additions of acids to carbon–carbon double bonds (Chapter VIII).

The section on the mathematical basis of resonance is much more than a condensation of material of interest to organic chemists from books devoted primarily to quantum mechanics and wonderfully reflects the high scholarship and careful thinking of the author. The dust jacket claims that the material is presented"...in a manner calculated to help the reader get as quickly as possible into those aspects of the theory which are of chemical rather than purely physical interest." Indeed, the reviewer found the preliminary discussions of the Schrödinger equation, the particle in a box, and the hydrogen molecule clear and straightforward. Getting to, and getting through, the subsequent section on matters of more interest to organic chemists, namely, the valence bond treatment of furan, were projects of different orders of magnitude. This section, and what follows, cannot be recommended as light reading but, no question about it, their mastery will improve one's understanding of resonance and molecular-orbital concepts.

The makeup of this volume is exceedingly attractive and great care had been taken to keep out errors in fact and proof reading. It is highly recommended for purchase and careful study by every serious student of organic chemistry.

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Introduction to Chemical Pharmacology. BY R. B. BARLOW, Research Fellow, Yale University School of Medicine; formerly I.C.I. Research Fellow, University of Glasgow; with a Foreword by H. R. ING, F.R.S., Reader in Chemical Pharmacology, University of Oxford. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1955. xiv + 343 pp. 14.5 × 22.5 cm. Price, $6.25.

In this condensed volume Barlow has summarized the current knowledge on the relationships between chemical structure and physiological action. It has apparently been his intent to give this information to the chemist who has little or no biological training. It succeeds in this intent, possibly at the expense of being, in some places, somewhat elementary in the descriptions of the purely biological subject matter.

Barlow has devoted practically all of his text to compounds which affect the actions of the various nervous systems. Conspicuous by their absence are the irritants, protoplasmic poisons, and the war gases, particularly the nerve gases and the sulfur and nitrogen mustards.

The section on the use of statistics is possibly too brief and the description of the dosage–response derivation may be misleading in that the response is related to the dose, rather than to the logarithm of the dose which is now common usage.

As an introduction to a highly complicated subject, however, the book is well worth the attention of the student. It is one of only too few works in this field.

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