BOOK REVIEWS

Introduction to Nuclear Engineering. By RAYMOND L. MURRAY, Professor of Physics, North Carolina State College of Agriculture and Engineering. Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N. Y. 1954. xiii + 418 pp. 15 × 22 cm. Price, $9.35.

This is a textbook in nuclear engineering which discusses a large number of reactor design and application aspects. It provides an elementary treatment of theoretical and practical problems to give the reader a broad view of reactor physics and engineering. In this respect it is certainly a valuable book and can be recommended highly as a concise introduction to the field. It will serve a needed function in the training of engineers for reactor work.

The background of the North Carolina water boiler is quite apparent, although there has been considerable success in incorporating theoretical approaches and problems appropriate to a variety of reactors. To quote the publicity on the jacket, the term nuclear engineering is not only "applied to the nuclear reactor—its design, construction, testing and operation, but also to such related activities as: the accumulation of nuclear fuel and other materials with unusual properties; the handling of radioactive chemicals; the design of instruments for experimental particle detection; establishment of standards and practices in radiation protection; and the use of isotopes for industrial and biological purposes. The technology and problems of the use of atomic energy in all its phases is discussed in detail."

The author uses a very direct approach in his development of the fundamentals of reactor theory. This has unquestionable pedagogical advantages, but although the student may remember reactor equations used in the book, the physical basis may not be understood in numerous cases. To say that many things are over-simplified is not in itself a criticism of the book. However, the student should not draw the conclusion that a reactor design can be determined in perhaps nine pages of text. Co-authorship with someone practicing in the field might open the vista to scan the complexity and challenge inherent in this field. Another over-simplification involves general statements which are applicable, for example, only to thermal reactors, but are made without any limiting qualification.

The only paragraph to which strenuous exception is taken discusses reactor safety practices. "For every safe reactor that is constructed, however, there are dozens of experimental assemblies of fissionable materials, each of which can be called a reactor in the general sense. Because of the transitory nature of these tests, the desire for quick answers, and the laboratory conditions under which they are performed, the chances of a radiation accident are tremendously increased." This comment is certainly contrary to reactor practices. If an addition to the book were to be suggested, it would be that some discussion of reactor safeguard principles and methods of analysis should be included since the choice of a reactor type and its location depend considerably on safety.

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The Infra-red Spectra of Complex Molecules. By L. J. BELLAMY, B.Sc., Ph.D., Principal Scientific Officer, Ministry of Supply. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1954. xvii + 323 pp. 15 × 22.5 cm. Price, $7.00.

This is the book several hundred chemists and spectroscopists have been waiting for. Especially in the years since the war, infra-red spectroscopy has been applied more and more generally to qualitative organic analysis and to the characterization of organic substances. There has been a real need for a comprehensive survey of, or at least a good guide to, the useful correlations between particular bands in the infrared spectrum and corresponding functional groups in the molecule. A number of "magic charts" have been published in the past summarizing these correlations; but, as Bellamy points out, "their incautious use can lead to wholly misleading results." And it has been very difficult to find the needed critical discussion of a particular correlation in the widely scattered literature of infrared spectroscopy.

Dr. Bellamy has brought together in this book, as he says, "a critical review of the data on which infrared spectral correlations are based, indicating the classes of compounds which have been studied in each case and the known factors which can influence the frequencies or intensities of the characteristic bands." In the places where we felt competent to judge his discussion, we found his remarks intelligent, informative and constructive, without being dogmatic.

The book is therefore a working reference for the chemist using infrared spectroscopy or the infrared spectroscopist dealing with chemical problems. It is in no sense a text book and no one will learn infrared spectroscopy from this volume. Nothing whatsoever is said about the practical techniques whereby one gets an infrared spectrum, nor is there any mention of structural concepts of molecules, or any clue to the reason why molecular vibrations are active in the infrared region. The omission of experimental descriptions is not particularly serious, since there are in fact several books available which describe the principles of spectroscopy, and indeed particular spectrometers, in considerable detail. However, it does seem to us that an introductory chapter giving some structural picture of molecular vibrations might have been very helpful. It is not difficult to show from such considerations why "group frequencies" exist, and even an elementary introduction to these concepts makes it much easier to understand which correlations are reliable and which are less certain.

We cannot refrain from applauding Dr. Bellamy's stand on the question of wave-numbers or wave-lengths: "the wave-number scale is the only really satisfactory one for correlation work." An ever-increasing number of chemical spectroscopists agree with this conclusion; to quote again, "probably the most powerful argument which can be advanced for the wave-length scale is the fact that it is easier to construct an instrument which is linear on this basis." We hope that chemists will continue to demand spectrometers which are designed for the user's convenience rather than the instrument maker's.

In short, if Dr. Bellamy's book is not an ideal treatment, it is a thoroughly satisfactory answer to a very real need, and we greet it with enthusiasm. Chemists using infrared spectroscopy have frequently received the negative advice to beware of the simple correlation chart; we can now add the positive advice to buy Dr. Bellamy's book and learn what the correlations really mean.

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Physico-Chemical Methods. Volume I and Volume II. By JOSEPH REILLY, M.A. (Cantab. and N.U.I.), D.Sc. (N.U.I.), Sc.D. (Dub.), D.ès.Sc. (Geneva), Professor of Chemistry, National University of Ireland and WILLIAM NORMAN RAE, M.A. (Cantab.), Sc.D. (Dub.), Professor of Chemistry and Physics, Royal College of Surgeons in Ireland. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 1953. Volume I—xi + 760 pp., Volume II—vii + 800 pp. 16.5 × 25.5 cm. Price, $15.00 per Volume.

This book is the outstanding treatise on the subject of experimental procedures in physical chemistry. The new 5th edition follows closely the tradition of the four earlier editions which have appeared regularly during the past quarter century. The rapid growth of the subject, especially in recent years, makes it difficult to keep the material up to date. The authors claim that numerous changes have been made in the 5th edition. However, these changes appear to consist essentially of the addition of a few new sentences and references at the end of each chapter. In a few instances more drastic revisions have been included.