# BOOK REVIEWS

**Statistical Mechanics of Irreversible Change.** By Richard T. Cox, Professor of Physics, The Johns Hopkins University. The Johns Hopkins Press, Homewood, Baltimore 18, Maryland. 1955. viii + 130 pp. 15.5 × 23.5 cm. Price, $5.00.

This booklet is an expanded version of Prof. Cox's recent papers on the thermodynamics of irreversible processes. Following a review of equilibrium theory, typical irreversible phenomena are treated on the basis of time-proportional transition probabilities among groups of states assumed to be in local equilibrium. This approach is applied in the linear approximation to topics such as Brownian motion, thermal conduction, thermochemical effects, thermoelectric effects and chemical rates. The treatment is concluded with a discussion of the constrained approach to equilibrium. Since the technique employed here provides an alternative to Onsager's regression of fluctuations approach, the pedagogic value of the book would have been enhanced by a more detailed examination of the basic inherent assumptions of the theory.

University of Rochester
Rochester, New York Frank P. Buff

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**Kolorimetrie-Photometrie und Spektrometrie. Eine Anleitung zur Ausführung von Absorptions-, Emissions-, Fluorescenz-, Streuungs-, Trübungs- und Reflexionsmessungen. Anleitungen für die Chemische Laboratoriumspraxis. Band II. Dritte Neubearbeitete Auflage.** By Gustav Kortüm. Springer-Verlag, Publishers, Reichpietschufer 20, Berlin W. 35, Germany. 1955. viii + 458 pp. 14.5 × 21 cm. Price, 36 DM.

This book is concerned with the wide variety of techniques involved in the colorimetry, photometry and spectrometry of the ultraviolet, visible and infrared and in the various applications of those techniques in fields as diverse, for example, as *p*H and concentration measurement, turbidimetry, Raman spectra and fluorescence. Its title is a modest statement of its objectives.

The first edition of this work appeared in 1942 and contained 209 pages of textual material (including index) in which the principal emphasis was on visual and photographic methods. At that time the common procedure in a laboratory in which a light-measurement problem existed was to tie together any available equipment (usually photographic for permanent records or thermoelectric for "direct" comparison) in more or less permanent form depending on the duration of the proposed study. Occasionally, photoelectric equipment would be connected into the apparatus, calibrated and made a part of some recording device, so that measurements might be made and recorded at higher speed and with more absolute reliability. More recently, the photomultiplier tube made other refinements possible. All these devices were the precursors of the highly integrated semiautomatic and automatic commercial units, the rapidly increasing variety of which has necessitated this third edition of a very useful book.

The text clearly shows a responsiveness on the part of author to suggestions and criticism of the earlier versions. An original 17 pages of "general fundamentals" has become 57 pages; the Lambert–Beer law is now the Bouguer–Lambert–Beer law with appropriate historical reference to the original contributor. The author now gives careful attention to the range of applicability of the law and the limitations on its usefulness. More than a hundred pages are now devoted to laboratory aids (small apparatus, solvents, etc.) for optical studies; the approach is detailed and thorough. Photoelectric and thermoelectric techniques together now take over 160 pages; in the first edition the latter received bare mention. A student who wants and needs to know why, as well as how, his apparatus works and what is its achievable range of reliability receives the guidance he requires. It is refreshing to have a text which makes unashamed reference to apparatus by its commercial name and the name of the vendor or manufacturer. For those who must choose apparatus most suitable for their immediate and longer range requirements, this book gives assistance of a kind which cannot be obtained by matching and discounting the discourses of competing salesmen.

The text is not a manual for the use of apparatus (although it contains 186 well-prepared illustrations) and does not replace the instructions which come with apparatus. The latter remain a necessity for which the author wisely does not attempt to provide a substitute. In a work so ambitious as is represented by the title it should be easy to discover omissions; the amazing feature is the number of techniques and pieces of equipment covered in a reasonably thorough fashion in a relatively short work. The inadvertent chauvinism corollary to an author's greater acquaintance with the work of his own country is minimal. References to American apparatus and techniques are particularly frequent. Doubtless, there are instances where specific technical improvements are overlooked but this reviewer is not able to report them in detail.

The third edition, like the first, concludes with ten detailed descriptions of applications of the various techniques but the applications given are not all the same; the change in choice presumably reflects developments of the intervening 13 years. It is regrettable, under the circumstances, that fluorescence-quenching, discussed in the last chapter of the first edition, is omitted from the third. The text (it appears to this reviewer) contains inadequate reference to recent remarkable achievements in that field, particularly in regard to measurements of very short half-lives of excited states.

This book is a desirable addition to the library of any group which uses optical equipment for routine analytical or research purposes or which contemplates the purchase of such equipment. For the graduate student it has the virtue that it not only acquaints him with a variety of apparatus but that it also emphasizes the role of theory in the making and interpretation of optical measurements. Format, composition and binding reflect credit on the publisher.

University of Notre Dame
Notre Dame, Indiana Milton Burton

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**Radiocarbon Dating. Second Edition.** By Willard F. Libby, with a chapter by Frederick Johnson. University of Chicago Press, 5750 Ellis Avenue, Chicago 37, Illinois. 1955. ix + 175 pp. 15.5 × 23.5 cm. Price, $4.50.

The earlier edition which appeared in the fall of 1951 has been ably reviewed by A. D. Bliss, This Journal, **75**, 6087 (1953).

Libby's book shows, in a fascinating manner, the universality of science, for seldom can a better example be found to illustrate how advances in one science open new vistas in even remote fields. Who would have expected a few years ago that advances in atomic and cosmic ray science would generate a dependable and highly popular dating method for archaeology and geology. Libby's radiocarbon dating method was so fruitful that special dating laboratories were set up not only in this country but also in Europe and Australia.

The new edition covers essentially the subject of the first edition, but it brings it up to date. In view of the great interest in the dating method, various improvements have been made to increase its accuracy and historical time range.

Instead of Libby's solid carbon, gas counting techniques have been developed. Acetylene as a counter gas was introduced by H. E. Suess in this country and by A. R. Crathorn in England. Carbon dioxide gas, which is simpler to prepare, is being investigated by O. Haxel in Germany, by C. J. Fergusson in New Zealand, and by Brannon, Taggart and Williams in this country.

Chapter VI, on radiocarbon dates, has been greatly expanded and now occupies 64 pages, but includes only dates determined in Libby's laboratory. Since Libby's book is likely to become a classic on the radiocarbon dating method,