very few reviews of the subject have been published. Thus Elton states, "The purpose of this book has been to systematize the experimental data that bear upon the density distribution of nucleons in nuclei and to correlate them, as far as possible, with current nuclear theories." He clearly succeeds in filling the gap, for the moment, in spite of the brevity of the book. He touches on virtually all the important methods of measuring nuclear sizes. Because of his own significant contributions to several aspects of the subject, Elton is able to write authoritatively about the basic methods and the quantitative results derived from them.

The important methods discussed in the order of their presentation, are electron scattering, muonic atoms, x-ray fine structure, isotope shift, mirror nuclei, semiempirical mass formula, high energy scattering of nucleons (use of the optical model), alpha scattering and alpha decay, meson scattering, absorption cross sections at high energies, and scattering of low energy neutrons. Following the discussion of methods, the author concludes with a chapter on the nuclear surface, including theory and experimental evidence.

Most subjects are covered thoroughly enough, in my opinion, in view of the incomplete or inadequate theory presently developed to account for the detailed facts of nuclear structure. A few subjects are dealt with in surprising detail for such a tiny volume. However, the method of the semiempirical mass formula for the nuclides is presented in an extremely brief way; some of the more recent work on this subject is not described, nor are recent references given. Elton does not mention a method of considerable importance, one which promises to yield much information on the mass density and neutron density distributions in nuclei, namely the method of coherent neutral pion production developed by the group at the National Bureau of Standards.

For the sake of completeness, there are a few minor points which should be mentioned. In numerous places Elton states that experimental results are based on relative cross sections rather than on absolute cross sections (pages 5, 19, and 20), whereas many of the data are in reality absolute within a somewhat larger error than indicated. Also, more recent absolute data are not given. In this respect the discussion of neutron size (page 21) is entirely out of date. Of course, this is a penalty for writing a book in a rapidly changing field. In a different context, the author sometimes gives figures and tables without mentioning the sources.

In spite of these minor imperfections, Elton has done a commendable job in collecting data and in making the subject understandable. People working in the field will find the book a necessity; others will find it interesting in many ways. It also provides a good example of how quickly a modern subject can develop in all its varied detail. I recommend the book highly.

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Mathematical Tools

Fourier Transforms and Convolutions for the Experimentalist. R. C. Jennison. Pergamon, New York, 1961. vi + 120 pp. Illus. $5.

The uninitiated can grasp the meaning of the Fourier transform by considering the behavior of a simple lens. The lens is ordinarily thought of as focusing the rays diverging from a point on an object to the corresponding point in an image, but it also focuses, at a point in the back focal plane of the lens, all rays which come from different points in the object and which are parallel to a single direction. The collection of such points in the back focal plane comprises the diffraction image of the object. In the process of focusing, rays from various points in the object (each located by the variable coordinate x) are brought together (integrated) on the diffraction image at a point located by a fixed coordinate X. Mathematically this can be expressed as $F(X) = f(x)e^{i2\pi xX}\mathrm{d}x$. The exponential term takes care of the difference in phase of the rays arriving at the point of focus. The direction of the light can be reversed so that the roles of object plane and diffraction plane can be reversed. If this is done, a summation occurs at the object which can be expressed as $f(x) = F(X)e^{-i2\pi xX}\mathrm{d}X$. Each of these equations represents a Fourier transformation. $F(X)$ is said to be a Fourier transform of $f(x)$, and vice versa. The relation is a beautiful one which is antisymmetrical in the phase $2\pi xX$, so that $F(X)$ and $f(x)$ are said to be conjugate and are called Fourier mates.

Jennison's book, with 110 pages of text, is short enough to be read in an afternoon. In seven chapters illustrated by 62 line drawings, it discusses the most important and useful properties of Fourier transforms.

The development of the topic includes four main features. The first is the meaning of a Fourier transform itself. A list of simple Fourier mates is included here, and the discussion is extended to two-dimensional Fourier transforms.

The next general topic is concerned with convolutions. A convolution is a kind of product of two functions. (A simple introduction to convolutions is through image theory [see M. J. Buerger, *Z. Krist.*, in press].) Its relation to Fourier transforms is given by the important theorem which may be stated as *the transform of a product is equal to the convolution of their transforms.* Jennison develops this important connection and thus provides a second stage in the discussion of Fourier transforms.

The third stage concerns the differentiation of Fourier transforms, and the author shows that the differential of a transform, $f(x)$, is its mate, $F(X)$, times the factor $i2\pi X$. This leads to the notion of a differential operator and later to an integral operator. The fourth and last facet of the discussion is the autocorrelation function.

The theoretical part of the development is interspersed, somewhat irregularly, with practical applications and is amply illustrated by line drawings. The book should be read by all who have any use for Fourier transforms. Nevertheless, it is not always easy to understand, and probably will be unintelligible to anyone who has not encountered Fourier transforms. For example, the first sentence of the book is "To the question 'what is a Fourier transform?' we may most simply reply: 'A method whereby we may obtain the variation of a quantity as a spectral function (e.g. plotted against frequency) from the variation of the quantity as a function of period (e.g. plotted against time).' " This and the following four pages are nonsense to the uninitiated. Only on the fifth page does Jennison briefly define the Fourier transform with an equation. The title informs the reader that this book is directed to the experimentalist, but it turns out that the experimentalist in mind is specifically one interested in electronics, for most of the examples come from that field. If the reader is not familiar with electronic jargon, he will not understand some of the text. While there are also

some optical examples, the obvious relation of Fourier transforms to diffraction is nearly ignored. In spite of the book's elementary nature, I do not recommend it to those without some previous knowledge of Fourier transforms. The fundamental theorems are not proven but merely stated. The quality of the teaching is often poor. To those with some background, however, it is interesting, especially in showing the relations between some simple Fourier mates, and it is also stimulating in bringing together the useful fundamental properties of Fourier transforms.

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Experimental Technique

Carbon-14 Compounds, John R. Catch. Butterworth, Washington, D.C., 1961. viii + 128 pp. Illus. $5.50.

John Catch's *Carbon-14 Compounds* is a welcome addition to the literature. Coming a dozen years after Calvin's pioneering, and now classic, *Isotope Carbon*, it takes careful measure of the intervening growth of what is still an art—the art of putting carbon-14 into complex organic compounds, applying these in tracer experiments, and assaying the results. The form of the book reflects the subject matter, which is abundant in detail but intractable in form.

The author is associated with the Radiochemical Centre of the United Kingdom Atomic Energy Authority, and he knows what should and what should not be included in a treatise of this sort. The result is practical, concise, and well balanced.

The first chapter deals with the production of C^{14} via the N^{14} (n,p) C^{14} reaction. Included is a discussion of the incorporation of C^{14} in organic materials by the direct neutron irradiation of nitrogen containing organic compounds; this discussion covers the work of Libby, Wolf, Yankwich, and Zifferero, among others. The incorporation of C^{14} by chemical synthesis and biological methods of labeling is covered in the next two chapters. Here, as elsewhere in the book, the bibliographies are unusually complete. For example, 203 references to journal literature appear at the end of the chapter on chemical synthesis. At that, the author makes no attempt to provide an exhaustive compilation, as the articles cited have been chosen to illustrate the text.

Catch then turns to consideration of a number of topics in a chapter entitled "Peculiar features of carbon-14 compounds." These topics include isomerism; double labeling; isotope asymmetry; rearrangements, exchange, and degradation reactions; behavior of small quantities; isotope effects; radiation decomposition; and nomenclature of carbon-14 compounds. This recital of the various special problems connected with the successful and accurate use of isotopic tracers is especially worthwhile.

A short chapter on analysis (including carrier dilution analysis), a quite complete chapter on the measurement of C^{14}, and a chapter containing some cogent remarks about precautions in the use of C^{14} compounds complete the presentation.

Anyone who is about to use C^{14} for the first time, or who has used this important isotope only occasionally, should not fail to read this book. Workers already in the field will be pleased with the extensive bibliographies. I recommend it also to undergraduates as collateral reading, for the insight it gives into an important experimental technique as well as into the subject of organic chemistry itself.

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Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, *but to the publisher or agency sponsoring the publication.)*

The Food Economics of Urban Middle Africa. The case of Ghana. Thomas T. Poleman. Food Research Inst., Stanford Univ., Stanford, Calif., 1961. 53 pp. Illus. $1.50.

A Guide to Fortran Programming. Daniel D. McCracken. Wiley, New York, 1961. 96 pp. Illus. $2.95.

Guidelines for Preparation Programs of Teachers of Secondary School Science and Mathematics. Recommendations of the Teacher Preparation-Certification Study of the National Association of State Directors of Teacher Education and Certification and the American Association for the Advancement of Science. AAAS, Washington, D.C., 1961. 36 pp. Report of a study supported by the Carnegie Corporation, New York.

Handbook of Electronic Charts and Nomographs. Allan Lytel. Bobbs-Merrill, Indianapolis, Ind., 1961. 58 pp. Illus. $4.95.

Industrial Transistor and Semiconductor Handbook. Robert B. Tomer. Bobbs-Merrill, Indianapolis, Ind., 1961. 254 pp. Illus. $4.95.

Laboratory Manual of Vertebrate Embryology. Roberts Rugh. Burgess, Minneapolis, Minn., 1961. 292 pp. Illus. $4.

NLL Translation Bulletin, vol. 3, Nos. 3–5. National Lending Library for Science and Technology, Department of Scientific and Industrial Research, London, 1961 (order from Her Majesty's Stationery Office, Box 569, London). Annual subscription, £2 13s.; single copy, 4s. 5d. Formerly entitled **LLU Translation Bulletin**, No. 3 contains a list of approximately 300 academies and research institutes in and near Moscow; No. 4, approximately 250 planning and design institutes, laboratories, and higher educational institutions in and near Moscow; and No. 5, information concerning 155 libraries of the Academy of Sciences of the U.S.S.R.

The National Peril. A statement by the NPA International Committee. Where we stand in national defense. Franklin A. Lindsay. National Planning Assoc., Washington, D.C., 1961. 61 pp. Paper, $1.

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Tulane University. *Tulane Studies in Zoology*, vol. 8, No. 6, pp. 155–182, $0.60. "The female reproductive cycle of the crayfish *Cambarellus Shufeldti*: the influence of environmental factors," Mildred E. Lowe; "Fecundity and reproduction in the largescale menhaden *Brevoortia patronus Goode*," Royal D. Suttkus and Bangalore I. Sundararaj. Tulane Univ. New Orleans, La., 1961.

Vertebrate Locomotion. J. E. Harris, Ed. Zoological Soc. of London, 1961. 140 pp. + plates. Paper, £1 12s. 6d. Proceedings of a symposium held 9 November 1960.

Wesleyan University Series. *The Earth and Its Story.* Geology for young scientists. Lou W. Page. 47 pp. *Exploring the Universe.* Allen Hynek. 47 pp. *Science Experiments.*" Original problems for independent discovery in biology, physics, chemistry. Editors of *Science and Math Weekly*. 31 pp. American Education Publications, Education Center, Columbus, Ohio, 1961. $0.15 each (in class quantities). A new series of science booklets intended for junior and senior high school classes, as supplements to regular textbooks.