
Books

External Properties of Atomic Nuclei. Vol. 38, Part 1 of *Handbuch der Physik*. Edited by S. Flügge. 471 pp. Springer-Verlag, Berlin, Germany, 1958. DM 118.00 (subscription price DM 94.40). *Reviewed by Herman Feshbach, Massachusetts Institute of Technology.*

THIS volume of the new *Handbuch der Physik* is, for the most part, concerned with the properties of the ground states of atomic nuclei. Of course not all properties are included in the discussion since in fact most experiments must involve some features of the stable or nearly stable nuclei. The main focus of this volume is on mass, radius, spin, and magnetic and quadrupole moments, although the mean square charge radius and compressibility are also briefly mentioned.

The first article by A. H. Wapstra on nuclear masses opens with a brief review of the various experimental methods employed for their determination after which a complete table of nuclear masses is presented. The remainder of the article is primarily devoted to an analysis of this table as contained in the semiempirical mass formula, in the systematics of α and β decay and finally in nucleon binding energies.

Microwave methods for the measurement of nuclear mass is the subject of the article by S. Geschwind. These methods employ the isotope shift in the rotational spectrum of molecules, which in turn is a consequence of the dependence of the moment of inertia of molecules on the mass of the constituent atoms. There is a discussion of the theory for diatomic and polyatomic molecules including such effects as anharmonicity and the contribution of the electrons to the measured moment of inertia. A brief description of the experimental techniques is followed by a table of relative masses obtained in this way together with a discussion of the errors in each of the measurements.

Magnetic moments and spins make their appearance in the next article by F. M. Kelley which describes the determination of these quantities by (1) magnetic hyperfine structure of atomic spectra, (2) atomic beam method, and (3) relative intensity of rotational lines in the spectra of homonuclear molecules. The theory which leads one from the experimental data to values for the spin and magnetic moment is reviewed. A brief description of the experimental methods is also given.

The isotope shift in atomic spectroscopy can be a result of the reduced mass effect and of the finite size of the atomic nucleus. It is the latter which is of major interest in the article by L. Wilets. Entering into this discussion are not only the gross nuclear volume effect

but also the nature of the nuclear charge distribution, the compressibility and deformation of nuclei. These effects among others are discussed and compared with experimental material.

By far the longest and most detailed paper in this volume, 256 pages in all, is that by G. Laukien on nuclear magnetism. The various molecular beam methods are described. The underlying theory including relaxation theory as well as an exhaustive treatment of experimental methods and errors is given. Because of its pivotal position much attention is paid to the absolute measurement of proton magnetic moment. This paper concludes with a table, 40 pages in all, of the measured values of the magnetic moment and spin, including the various measurements which have been made by different authors, and the method employed by each as well as the experimental uncertainty.

The last paper in this volume, on nuclear quadrupole moments, is written by C. H. Townes. Besides discussing the various electromagnetic methods and the related theory, the determination of "q" etc., this article also includes a discussion of the effects of the asphericity of atomic nuclei on electron scattering, on nuclear rotational energy levels, on neutron scattering and absorption, and on the (γ, n) resonances of nuclei. A table of the measured values together with a brief discussion of their systematics concludes the article.

Transport Processes in Statistical Mechanics: Symp. Proc. (Brussels, Aug. 1956). Edited by I. Prigogine. 436 pp. Interscience Publishers, Inc., New York, 1958. \$10.00. *Reviewed by George Weiss, Weizmann Institute of Science.*

ALTHOUGH the outstanding questions of statistical mechanics are not substantially different from those, say at the beginning of the present century, the methods and choice of specific problems have reflected the passage of years. A somewhat abbreviated summary of current trends in transport processes as of 1956 is presented in the volume under review.

A currently favorite problem is the derivation of Boltzmann's equation from Liouville's equation. This is the subject of papers by Kirkwood and Ross, M. Green, and Brout. Little of lasting interest seems to be reported by these authors (this is not to belittle their efforts, but the difficulty of giving a rigorous derivation without resort to dubious approximations is too well known to require special comment). A major piece of work has been reported on by Alder and Wainwright in their article "Molecular Dynamics by Electronic Computers". They study the transport properties of a gas of hard spheres by following the trajectory of each particle, obtaining results which are remarkably free from fluctuations considering that their gas consisted of about 100 particles. As important as this work is as an "experimental" test of existing transport theories, it is also important in demonstrating that substantially better results in this direction can only be obtained by computers that are many orders of magnitude faster