significant figures where errors of the order of 10 per cent or more are expected; the insertion of occasional cautioning statements or the possible convenience for numerical work do not seem adequate justifications.

The book contributes to pure as well as to applied physics through very extensive and laborious new calculations on the distribution of radiation energy throughout matter. The author's emphasis on recognizing and analyzing the role played by secondary electrons in this process represents an important advance. As stated in the appendix, the calculations are based on somewhat tentative theoretical assumptions; the eventual influence of these assumptions should be estimated when utilizing the numerical results. The author emphasizes that the energy of photo- and recoil-electrons released by x rays of 10–100 KeV is far from proportional to the x-ray voltage; however, what is important for application is the apportionment of the total x-ray energy among electrons of different energies rather than the apportionment of all the electrons among different energy ranges. The latter is represented by the "mean energy" given in Table 3 of the book. The former is represented by a "weighted mean energy" calculated by giving each electron a "weight" proportional to its energy and is much more closely related to the x-ray voltage.

This book is timely, useful, and important and is recommended for widest circulation; judgment should be exercised, however, in utilizing its content.

The book was completed in the middle of 1944 and became available in England early in 1946. Commercial arrangements prevented its distribution in America until a year later. While the former delay may be charged to war conditions, the latter is highly regrettable.

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Fisica nucleare: dalla pila di Volta alla pila atomica. Plinius Campi and Aldo Rusconi. Milan: Ulrico Hoepli, 1946. Pp. viii + 215. (Illustrated.) Lire 400.

This book covers more ground than the title suggests, since it represents a general survey of the advances of atomic physics from the advent of relativity and the quantum theory to the utilization of nuclear energy.

Chapter 1 includes a condensed account of the structure of matter, ions and electrons, Bohr's atomic model, isotopes, radioactivity, and Planck's quantum hypothesis. Chapter 2, bearing the title "Space, Time, and Causality," gives an elementary account of restricted relativity and of the failure of the principle of causality in quantum physics as expressed by Heisenberg's uncertainty relations. The authors take the occasion for setting forth certain views of their own on the structure of the geometrical continuum. In the reviewer's opinion, whatever the value of such theories may be, discussion of them should be reserved for papers of a technical character and is rather out of place in a book of this type. Chapter 3 is a discussion of the wave properties of material particles as expressed by Schrödinger's equation. Chapter 4 includes an account of radioactivity, artificial disintegration of nuclei, neutrons, and the conditions which determine nuclear stability. Chapter 5 discusses the fission of heavy elements and the utilization of nuclear energy.

The book does not require from the reader more than a general knowledge of elementary physics and mathematics, and the difficult task of popularizing such a vast amount of material is, for the most part, well done. Perhaps the account of the principles of restricted relativity and of quantum mechanics contains some obscurities that might have been avoided. Inaccuracies are few and unimportant.

This book will be particularly useful to readers of a scientific mind, such as chemists, engineers, biologists, etc., who, not being physicists, are not familiar with the more technical accounts of atomic physics and look for an elementary but accurate résumé of the subject.

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Relaxation methods in theoretical physics. R. V. Southwell. Oxford, Engl.: Clarendon Press, 1946. Pp. vi + 248. (Illustrated.)

This volume, a continuation of the author's earlier monograph on *Relaxation methods in engineering science* (1940), constitutes an extremely important contribution to the literature of applied physics. It shows that almost any boundary-value problem in two dimensions for which one can write down the partial differential equations, and the solution of which one desires badly enough, can be solved by a sort of brute-force, cut-and-try numerical method of attack. It should go far toward dispelling the common idea that there is nothing that can be done about a two-dimensional problem for which an analytical solution has not or cannot be found, except perhaps to look for a physical analogue which is capable of experimental evaluation.

Southwell, in this volume, shows solutions of problems in torsion of solid and hollow cylindrical shafts, magnetic fields in regions containing iron, conformal transformation, capacity of cables, torsion of shafts of circular section but nonuniform diameter, torsion of tores, temperature distribution, shear stress trajectories, oil pressure and temperature distribution in bearings, flow of gas through convergent-divergent nozzles, plastic torsion, percolation, and shapes of free liquid jets.

The versatility of his methods is perhaps best illustrated by these last examples, in which the hydrodynamic equations are solved for free jets whose very shape is unknown at the start, and by H. W. Emmons' successful application (*N. A. C. A. Tech. Notes*, 1944, No. 932; 1946, No. 1003) of these methods to compressible-fluid-flow problems involving shock waves whose positions are initially unknown.

The relaxation procedure starts by replacing the two-dimensional continuum by a 'net' of points and the partial differential equation by a difference equation relating the function value at a given net point to its values at neighboring points. The finer the net, the closer is the approach of the solution of this difference problem on the net to that of the differential problem in the continuum. A trial-function value is estimated at each net point, and in terms of this trial function a 'residual' is computed, this being the amount by which the difference equation fails to be satisfied at each point. The residuals are then 'relaxed' to zero, or worked out to the boundary where they disappear, by successive and repeated changes in the function values at the various points,