clude: electric dipole, magnetic dipole, and electric quadrupole. Primarily, the central-field approximation is the basis of the calculations. One is then able to separate out the radial and angular contributions to the matrix elements of the transitions. The methods of Racah's tensor algebra are used mostly in calculating what the author calls "reduced strengths" of the transitions. This is the contribution to the strength of the transition that comes from the angular part of matrix elements. There is also a short discussion on absolute line strengths by means of the Bates and Damgaard approximation. Many types of coupling are considered such as: *LS*, *jj*, *jL* and also transitions between states that are not describable by one configuration.

About 20–25% of the book is devoted to tables. Unfortunately, there is not a one-to-one correspondence between the references of the text to the tables and the tables that appear in appendix. This may be a result of a deficiency in the translation. For example, in some of the legends of the tables there is a reference to a particular page. However, one finds that the tables under discussion appear elsewhere. The page number was apparently from the original Russian text. Except for a few notable exceptions that are pretty obvious for anyone with some familiarity with the field, the translation is generally good. The translators have been careful to reproduce the various formulas by photographic means. Because of this, the proof-reading errors in the original were simply incorporated here too. A notable deficiency in this book is the lack of an index. Although there is a fairly comprehensive table of contents, it still does not take the place of an index.

A major point of disagreement between the authors and myself is in regard to method. The authors emphasize in all the calculations the strengths of the transitions. Therefore, they list the strengths in the tables to about three decimal places. This is fine if all atoms obeyed what the authors call "normal coupling." However, most elements do deviate somewhat from "normal coupling" and are better described by intermediate coupling schemes. In this case it is more important to know for each of the various transitions in a transition array in a "normal coupling" representation, the square roots of the strengths and their phases. One can treat these as matrix elements and find the strengths in intermediate coupling. With the availability of electronic computers, these calculations are quite feasible. The formulas for calculating the square roots of the strengths are obtainable from the text, but in these cases the tables are useless.

In spite of the above criticisms, I find that this book is a welcome addition to the library on atomic physics.

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Harold Mendlowitz has been calculating transition probabilities for atoms and ions at the National Bureau of Standards.

Unconventionally viewed

FROM PYTHAGORAS TO EINSTEIN. By K. O. Friedrichs. 88 pp. Random House, New York, 1965. Paper $1.95

by R. Bruce Lindsay

One of the beauties of mathematics and the sciences that use it is the great variety of ways in which one can look at a given theorem or law. This is well brought out in the little book by the well known professor of applied mathematics at the Courant Institute of Mathematical Sciences of New York University. He has taken the Pythagorean theorem, and starting from its significance in elementary geometry shows how it can be viewed in different lights in more sophisticated branches of mathematics and even in kinematics. He ultimately finds himself involved with special relativity. The book is one in a series entitled "The New Mathematical Library" intended to provide stimulus, excitement and new depth to the teaching of mathematics on all levels from secondary school through college.

Much of the material in this book is readily usable in high school and is calculated to add interest to the conventional presentation of geometry. The notion of vector is introduced early, not from the normal standpoint of its transformation properties but in

terms of its mathematical properties of summation, multiplication, etc. A proof of the Pythagorean theorem by this method is given. Then it is shown that from the definition of the magnitude of a vector the theorem is reduced to the status of a definition, an interesting exercise in the logic of science.

The second half of the book carries the story over into physics with an ingenious discussion of linear elastic impact of particles. Mass is defined in terms of impact. There is no introduction of force at all, but momentum and kinetic energy are treated as the fundamental constructs of mechanics. The conservation theorems are developed, leading to another interesting illustration of the Pythagorean theorem. Next, inelastic impact is considered, with springs as models. Conservation of energy is maintained by the introduction of a new kind of energy called "internal" energy. This sets the stage for the introduction of special relativity, which is developed in terms of four-dimensional vectors—essentially the Minkowski approach. Relativity mechanics is then used to discuss the problem of impact. Application to inelastic impact in reverse, i.e., an explosive process, leads to a very simple and instructive interpretation of the Einstein intrinsic or rest energy m_0c^2.

The book is clearly and engagingly written. It sheds entertaining and instructive light on aspects of physics usually treated more conventionally in college courses.

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Nonmathematical

RADIATION DAMAGE IN CRYSTALS. By Lewis T. Chadderton. 202 pp. (Methuen, London) Wiley, New York, 1965. $6.75

by M. E. Straumanis

This book is a modern one, as its content originated nearly entirely in the years since the end of the second world war. It is based on the experience gained when radiation strikes solid matter (for instance, single crystals), and on the effects produced by the respective radiation. The author is demonstrator in physics at the Laboratory for Physics and Chemistry of Solids, Cambridge University, and directs research into problems of radiation damage and the defect solid state. He writes in the preface: "In order to make the text more readily understood by the general reader the treatment has been kept as nonmathematical as possible, and analytical methods have only been used where they show up the physical ideas most sharply. Only a passing knowledge of mathematical physics is assumed. The book has been written for engineers, physicists, metallurgists, reactor technologists, final-year physics students, and for scientists who would like to become familiar with present ideas in this new and emerging field."

The chapters of the book are: 1, Defects in crystals (15 pages); 2, The displaced atom (20); 3, Spike phenomena and displacement cascade (21); 4, The influence of the ordered lattice structure: correlated collisions, focusing and channeling (27); 5, Complete simulation of radiation damage processes (39); 6, The atomic interaction potential (25); 7, Range equations and rates of energy loss (36) and 8, Special topics and techniques (20).

There are eight very good plates and 68 line drawings in the book. Each chapter terminates with "Selected References" for further study and some of them have conclusions that make it easier to grasp the essence of the respective chapters.

However, the book is not an experimental but a theoretical one, which tries in simple language to find relations between the various phenomena introduced by and observed during the irradiation of crystals. It simultaneously explains the concepts used in articles dealing with radiation damage, such as various kinds of dislocation and point defects, stacking faults, thermal, displacement, plasticity and fission spikes, chanellons, crowdions, etc. The culmination point of the book is reached in chapter 5, where the results of the radiation damage of face- and body-centered elements are discussed. The results mentioned were