Theoretical Physics. Mechanics of particles, rigid and elastic bodies, fluids, and heat flow. F. Woodbridge Constant. Addison-Wesley, Cambridge, 1954. xiv + 281 pp. Illus. $6.50.

According to the author's preface,

> This book is intended primarily as a text for a senior-graduate course in physics. In many of our colleges the elementary and intermediate courses in physics are followed by an introductory course in theoretical physics, open to eligible juniors, seniors, and beginning graduate students. Many students, as well as professors, have agreed that such a course is of great value. It not only serves as a bridge between the more elementary, factual undergraduate courses and the more advanced, analytical ones of graduate school, but it also provides a valuable review of physics and mathematics at a higher level. The aim of this book is to help achieve such a goal.

The book is divided into three parts: vector analysis, mechanics, and heat flow.

The section on vector analysis (44 pp.) is divided into three chapters dealing with the algebra of vectors, the calculus of vectors, and dyadics. A vector is defined as a quantity having "both a magnitude and a direction." The addition law is taken as experimental, and no mention is made of transformation laws in the *definition,* although orthogonal transformations are discussed later. The vector operator ∇ is *defined* in terms of rectangular coordinates; and the gradient, divergence and curl are then defined in terms of ∇. This makes transformation to other coordinate systems quite cumbersome, but more important it obscures the physical significance of divergence and curl. In dealing with curvilinear coordinates, the author does a very careful job of discussing the derivatives of the unit vectors, but then he fails to point out the pitfalls of applying ∇^2 to a *vector* function if the components of the vector are expressed in other than rectangular Cartesian coordinates.

Part II consists of 11 chapters devoted to mechanics, elasticity and fluid dynamics. Kinematics, other than for rectangular Cartesian coordinates, is restricted to two dimensions, and the treatment is quite satisfactory. With the background chapters on vectors in three dimensions, it would have been very easy to extend this treatment to at least spherical coordinates. There is a good elementary treatment of motion relative to moving axes. Gravitation is treated in five pages, and gets no further than one might expect in an elementary course. There follow chapters on particle motion and motion of a system of particles. There is ample treatment of rigid body motion, too large a fraction of which seems to be devoted to motion about a fixed direction, and a chapter on advanced dynamics in which Lagrange's equations are obtained as well as the Hamiltonian equations. The principle of least (stationary?) action is discussed in some detail. There is a concise chapter on the elements of elasticity, followed by one on elastic waves and sound, and a short chapter on viscous mediums. The section concludes with a chapter on general principles of fluid dynamics; more could have been done with the chapter on viscous mediums had it followed this one, which contains a clear concise treatment of the subject.

Part III, a single chapter of 12 pages on heat flow, is the least satisfactory. Just as things begin to get interesting, we come to the end. The problems are mostly elementary, and do not even do justice to the chapter material, some of which is unnecessarily complicated. For example, it is stated that two integrations by parts are necessary in order to evaluate the integral of the product of two sine functions, whereas, in fact, none are necessary.

The degree of difficulty of the material presented in the book is far from uniform, and this is not necessarily a criticism. However, quite a bit of the material should be familiar from a first course in physics. Also, one might wish that the illustrative examples were more thought provoking. The book could serve a useful purpose as a second course in physics after a good quantitative first course, or for self-study by the more ambitious student. In a new edition, more attention might be given to detail and completeness, which could easily be done by omitting some of the more elementary portions.

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Biological Effects of External Radiation. Henry A. Blair, Ed. McGraw-Hill, New York—London, 1954. xviii + 508 pp. Illus. $7.

This volume summarizes the major part of the studies made during the World War II period on the biological effects of x-radiation at the University of Rochester, and on the effects of chronic neutron irradiation at the Biochemical Foundation, Newark, Delaware. There are three parts to the book: part 1 deals with the effects of single doses of whole-body x-radiation (8 chapters, approximately 200 pp.); part 2 is concerned with chronic x-radiation (7 chapters, approximately 200 pp.); part 3 deals with the effects of fractionated doses of fast neutrons (2 chapters, approximately 100 pp.). There is an 8-page subject index.

In the first part single doses of x-rays are reported with regard to their effects on the mortality of rats, dogs, and monkeys (Boche and Bishop), pathological changes in rats (Metcalf, Blandau, and Barnett), peripheral blood in rats, dogs, and monkeys (Ingram and Mason), callicrein in dogs and rats (Fink), cross-circulation experiments with cats (Lawrence and Valentine), finger-ridge changes in monkeys (Harvey), mutation rate in fruit flies (Spencer and Stern), and their effectiveness in comparison with beta radiation in rabbits (Bishop).

The second part discusses the effects of chronic x- (or gamma) irradiation on rats, dogs, monkeys, and rabbits (Dowdy, Boche, and Bishop), their growth, survival (Boche), and peripheral blood (Ingram and