overcrowded with footnotes, which stifle the effect that a continuous narrative might have given. On the other hand, there are numerous flashes of insight into the significance of an act or the character of an actor that suddenly light up the situation and almost justify the rather drab setting without which they would not stand out so clearly. But the interest is maintained throughout, and the reader feels that he has been admitted not to a drama of the imagination but to events that actually happened.

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Applications of Spinor Invariants in Atomic Physics. H. C. Brinkman. North Holland, Amsterdam; Interscience, New York, 1956. 72 pp. $3.25.

This slim monograph is intended to introduce the physicist to spinor invariants and their use in atomic physics. The development of these methods was initiated by H. A. Kramers, to whose memory the book is dedicated. Spinors and their invariants are introduced into atomic physics systematically, not only to treat the electron spin but for all quantities that might otherwise be represented as spinors, vectors, or tensors. That this is possible is well known. All of these quantities have transformation laws that are representations of the three-dimensional orthogonal group or, in relativistic theories, of the four-dimensional Lorentz group. They may be obtained from the representation by spinors as multiple Kronecker products. In less technical language, a vector is equivalent to a set of quantities bearing two spinor indices, and so on. Accordingly, the possibility of formulating all the more important results of invariance-theoretical considerations in spectroscopy by means of spinors and their invariants is beyond doubt. Whether it is desirable, as a means of unifying a variety of different results and considerations, is largely a matter of taste.

The book is divided into three major parts: the first deals with the formal relations between three-dimensional rotations in a real space and two-dimensional unitary transformations in a complex space; the second is devoted to the construction of wave functions for systems containing N spinning electrons; and the third deals with some more detailed calculations, including spin-orbit interaction and intensities of spectral lines.

The presentation is on the whole clear and straightforward. In my opinion the presentation of the foundations would have gained much if it were less formal. As it is, the introduction of spinors appears contrived and artificial. A reader who is already familiar with spinor theory will have little difficulty in this respect, but he does not require the wealth of mathematical detail offered in the first part. Aside from this criticism, the author should be commended for building the theory step by step, treating, for instance, the scalar (nonrelativistic) electron before introducing the Pauli electron. Whether the omission of Dirac's relativistic theory can be justified is another question.

Because of the somewhat historical nature of the subject matter, including the restriction to nonrelativistic atomic physics, it is questionable whether a monograph was the ideal form of publication for this article. Articles of similar scope are frequently published in such journals as the *Reviews of Modern Physics,* whose subscription price for a year is only slightly higher than the price of this book.

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Nuclear Radiation Detectors. J. Sharpe. Methuen, London; Wiley, New York, 1955. 179 pp. $2.50.

This little volume is one in the well-known series of Methuen's Monographs on Physical Subjects. It covers virtually the entire field of nuclear radiation detectors in 180 small pages. There are six chapters containing the following material: Chapter I, introduction, is a brief qualitative description of the basic processes involved in detection. Chapter II is more specific and more quantitative and describes the interaction of neutrons, gamma rays, and charged particles with matter. A short section of this chapter discusses Cerenkov radiation. Chapter III, on detection media, is a larger chapter describing phosphors and scintillating crystals, secondary emitters, crystal conduction counters, and gaseous ionization media.

The efficiency of detectors is covered in Chapter IV. This material includes solid angle considerations, window absorption, electron yields from the walls of Geiger counters, and so forth, and a section on mean level detectors (as distinguished from detectors counting individual events) and dosage measurements. Chapter V is concerned with the scintillation counter. In this chapter, one finds a brief discussion of the photomultiplier, an unexpectedly large section on alpha-particle scintillation counters, some discussion of the uses of scintillation counters as electron and gamma-ray energy spectrometers, and a cursory account of fast-and-slow-neutron scintillation counters.

Chapter VI is the last and largest chapter and is concerned with gaseous ionization devices, such as ionization chambers and counters, proportional counters, Geiger counters, Geiger-Müller counters and their various properties. One can see from the rather ample list of topics discussed by Sharpe that, on space considerations alone, a thorough handling of each subject would be impossible. Yet the detail presented is quite surprising, and in many respects the work is written with authority. The author is obviously well grounded in many of the various fields he chooses to describe.

The diagrams and other drawings are well chosen; the tables are quite informative and up to date. Mathematical expressions appear to have been selected with attention to their basic importance. I am much impressed by the last chapter on gaseous ionization detectors.

There are a few minor matters that I noticed which may need a little comment. The general method of growing NaI(Tl) crystals uses the Bridgman method rather than the Kyropolous method (p. 121). The decay constant of ZnS-Ag has been reported by Koontz to be faster than the 3×10^{-6} sec given on page 126. The Sternheimer reference (33), on page 36, to energy loss of electrons has been rendered obsolete by a later Sternheimer reference (*Phys. Rev.* **91**, 256 [1953]).

All in all, I heartily recommend this little volume to veterans of the field as well as to beginners. If a concise book on nuclear-radiation detectors is needed, then this book is *it*. It is to be hoped that Sharpe may someday be willing to expand the material into a full-length venture.

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Protoplasmatologia. Handbuch der Protoplasmaforschung. vol. VIII, *Active Transport through Animal Cell Membranes.* Paul G. Lefevre. Springer, Vienna, 1955. 123 pp. Illus. $9.

In the branch of cellular physiology that deals with "permeability," the notion of "active transport" has gained considerable ground during the past few decades. In his discussion of this development, the author places emphasis on the lines of investigations that have to do more or less directly with the activity of cells in the translocation of substances through the cell surfaces and avoids including other physiological processes that conceivably might fall under the heading of the volume but would necessitate ad-