ever that energy can be generated spontaneously." What a wealth of human intervention and opinion this sentence embodies! It almost suggests the attractions of the completely antithetical view represented so engagingly and often convincingly by Eddington.

Nuclear Radiation Detection. By William J. Price. 382 pp. McGraw-Hill Book Co., Inc., New York, 1958. $9.00. *Reviewed by R. M. Williamson, Duke University.*

This book was written as a text for a nucleonics instrumentation course and is primarily concerned with neutron detectors and with detectors appropriate for radioactive isotope work. Along with the qualitative discussion of detectors there is enough detailed information to allow the reader to select equipment and to read further into design problems. When supplemented by more detailed accounts of the interaction of radiation with matter and of electronics the book should serve well as a laboratory text or as a reference book for a nuclear physics course. There are many drawings from recent articles, graphs, tabular material, and up-to-date references which will be of great help to anyone concerned with nuclear radiation detectors.

The chapters on electronics and on the interaction of radiation with matter are necessarily brief. The chapter on scintillation counters is excellent and includes a qualitative description of the scintillation process in organic and inorganic materials. Ion chambers, proportional counters, and Geiger counters are dealt with in separate chapters. Emulsions, cloud chambers, and other devices are treated very briefly. The author has made an excellent selection of material appropriate for an introduction to radiation detectors.

Atmospheric Explorations: Papers of the Benj. Franklin Memorial Symp. of the American Academy of Arts & Sciences. Edited by Henry G. Houghton. 125 pp. The Technology Press of MIT & John Wiley & Sons, Inc., New York, 1958. $6.50. *Reviewed by Ferguson Hall, US Weather Bureau.*

This is a collection of five papers given at a memorial symposium of the American Academy of Arts and Sciences on the occasion of Benjamin Franklin's 250th birthday. Fittingly, the papers deal with atmospheric electricity and lightning and with certain aspects of the high and very high atmosphere in which Franklin was also interested. The authors are all outstanding experts and each lays before us an impressive picture of the known facts, the results of years of study of a particular problem, and the conclusions which he and others have reached.

The first paper, by Ross Gunn, tackles the knotty problem of how clouds become electrified. Joachim Kuettner next discusses the equally difficult problem of charge separation in thunderstorms leading to the lightning discharge. Both papers present highly interesting, although not universally agreed upon, mechanisms which might account for the observed phenomena. The reader will be convinced of the extreme complexity of this branch of cloud physics. Next Leonard Loeb gives the results of years of research into the complicated sequence of events associated with seemingly simple lightning strokes. Again many vital questions remain unanswered. Of special interest is the way in which many features of lightning are reproducible in the laboratory and have led to new findings regarding the common electric spark. Harry Wexler next paints a broad picture of the motions and dynamics of the rarefied high atmosphere, the interaction between various layers, and the possibilities of solar effects on short-term weather. A highlight is the sudden "Berlin" warming (45°C in 2 days) which occurred at high levels (30 km) in 1951. The last paper, by Henry Booker, deals with the very high atmosphere (ionosphere) where free electrons exist in quantity and reflect and scatter radio waves. Included is background material on the new vhf scatter propagation technique.

Our knowledge is still meager in many respects, both as to the very high atmosphere and in the fields of atmospheric electricity and cloud physics, and much further exploration is needed. The book is a very worthwhile introduction to a few of the many engaging fields of atmospheric research.

Eigenfunction Expansions Associated with Second-Order Differential Equations, Part 2. By E. C. Titchmarsh. 404 pp. Oxford U. Press, New York, 1958. $11.20. *Reviewed by T. Teichmann, Lockheed Missile Systems Division.*

Using the methods of function theory, Professor Titchmarsh has continued his studies of eigenvalues, eigenfunctions, and expansion theorems of the ordinary differential equation

$$f''(x) + [\lambda - q(x)]f(x) = 0$$

and also extended them to the partial differential equation

$$\nabla^2 f(x, y, \cdots) + [\lambda - q(x, y, \cdots)]f(x, y, \cdots) = 0$$

Many of the topics dealt with have, of course, been treated more generally in the past by the methods of Hilbert space theory and the theory of singular integral equations. The interest in Volume 1 centered mainly on the application of function theoretic techniques to these problems and tended, therefore, to be confined mainly to analysts. In the present work, however (Volume 2), these techniques have not only intrinsic interest but serve to elucidate to a considerable extent many results of the general theory.

While many of the results and methods are applicable to multidimensional problems, Professor Titchmarsh has simplified the exposition considerably by confining many of the more gory details to the one- or two-dimensional cases. However, where the extension to more dimensions is not direct, he has not hesitated to carry it out with the necessary detail.

Sections of particular interest which illuminate the