tion; yet the study of Brune's classic thesis enlarges his engineering vision and may indeed become part of the very warp and woof of his critical intelligence, just as appreciation of a great novel or poem creates a new or heightened awareness of life.

For a long time few books that treated the modern aspects of network theory were available; then suddenly everyone was writing a book on "modern" network theory. As usual, some of these books are being done as a matter of duty, perfunctorily: a professor teaches a course, prepares notes, and before you can say "Jack Robinson", a new book is out. The only modern aspect of some of these books is that they use the complex-frequency plane. Other books are prepared as a labor of love. *Network Synthesis* by Professor Tuttle falls in the latter category.

There are many evidences of the loving care that has been bestowed on this book. The author is facile with words and has taken great pains to achieve clarity. He has also taken pains to achieve accuracy, for the book is remarkably free of errors of any kind. And though in his first chapter he calls the book an introduction, he has striven mightily to cover the subject more thoroughly than it is treated in any other text.

A first reaction on contact with the book is that it is heavy: it is 1175 pages long. It treats synthesis of the driving-point function only; treatment of the transfer function is reserved for Volume 2. The first three chapters are concerned with a review of analysis and function theory; the treatment of analysis is sketchy and in this reviewer's opinion could well have been omitted—or expanded. Chapter 4 derives network properties from energy considerations and Chapter 5 treats some properties of driving-point functions. Synthesis proper begins in Chapter 6 with the realization of the inductance-capacitance (LC) two-terminal network and is continued in Chapter 7, which covers the RC and RL networks. Chapter 8 then returns to a derivation of properties of driving-point functions. The remaining chapters cover RLC synthesis and some illustrative applications, and give an exhaustive treatment of approximation techniques. More than 300 pages are devoted to the approximation problem.

The book has a wealth of detail and contains a large number of problems. Most of it is fairly easy reading, except for repetitiousness and the author's disturbing use of parentheses. It is also a bit incongruous to discover in the book phrases like "shiny new tools" for our "tool kit" and "wonderland of function theory" along with "the second of two asseverations", "a list . . . of redactions", and Greek and Latin quotations heading some of the chapters.

One improvement in the theoretical discussions might be mentioned. On page 194 the discussion in the last ten lines gives the impression that the zeros of the numerator and denominator must be calculated in order to determine whether common factors exist. This of course is not necessary: Euclid's algorithm provides the greatest common factor directly. More important, in the discussion on the top of the page it is mentioned that Sturm's theorem is required to determine whether a remainder function $E(p)$ has right half-plane zeros. Though Sturm's theorem may be used, it is simpler to expand $E'(p)/E(p)$ in a continued fraction, where $E'(p)$ indicates the derivative of $E(p)$.

The book should serve as an excellent reference for research workers. Whether it is satisfactory for a course on synthesis is a moot point. Granting the importance of synthesis, the question can be raised whether so much time can be given to the driving-point problem. Surely the major parts of the book cannot be adequately taught in a three-month course, a claim the author makes in the preface. Too much of a burden is placed on the shoulders of a hypothetical "good teacher".

Thus one returns to one's first reaction. The repetitive form of writing and the use of unnecessary qualifying phrases make the book too long. The detail finally becomes cumbersome. This, of course, is a danger of falling in love.

Basic Physics. By A. R. Meetham. 144 pp. Pergamon Press, London & New York, 1957. $3.75. *Reviewed by Ira M. Freeman, Rutgers University.*

In compiling this book, the author set himself the task of describing physical phenomena in a purely objective way, completely free of any taint of anthropomorphism. He believes that "a description of the physical world which eliminated human subjectivity would deserve the name of pure physics." The result is a highly condensed running account of selected facts of physics which is neither a textbook nor an interpretive account for the general reader.

Dr. Meetham believes that his approach, since it eliminates all reference to experimental procedures, permits him to treat his topics in any order desired. The general sequence he employs threads its way through wave motion and optics, mechanics and properties of matter, electricity and magnetism and, finally, heat.

Important results are quoted as formulas, but their derivations are, except in a few instances, not given. This makes the body of the book a rather prosaic recital of some of the basic factual material of elementary physics, resembling perhaps much too closely the type of "cram book" often displayed on the counters of college bookstores. There are no problems or other exercises.

The question of the objectivity of the physical world is of course not a new one in the history of philosophy. Certainly there is always room for any discussion that comes to grips with this problem. However, it would seem questionable that Dr. Meetham's book, considering especially the audience for which it is intended, could add much that is significant in this regard. Besides, the author is not completely consistent. After repeatedly asserting his policy of keeping "our persons and our world out of basic physics wherever possible" he makes the statement: "The foundations of physics have been disturbed before now, by Newton, Planck, Rutherford and others, but there is no possibility what-

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