the applied magnetic field is stationary or is varied very slowly. The topics covered are miscellaneous and center about such subjects as the theory of the hysteresis curve, measurements of crystal anisotropy and magnetostriction in ternary alloys, and the permeability and coercive force in the cubic ferromagnetic oxides. The investigation of the magnetic oxides represents the profitable renaissance of a subject that has barely been touched in the past.

The second part, dealing with the dynamics of ferromagnetism, summarizes that class of magnetic properties of steel and related substances which vary with time as a result of the diffusion of the interstitial carbon or nitrogen atoms. One of the most conspicuous of these effects is the decrease with time of the permeability that is observed following a change in magnetization—an effect to which Snoek has given the name "disaccommodation." Snoek presents a closely correlated group of experiments concerning this and related effects and summarizes the very beautiful theory with which he has interpreted the observations.

The third section surveys in considerable detail the properties of the mixed ferromagnetic oxides or "ferrites" which were touched upon in the first part of the book. The influence of temperature and composition are treated. For example, the variation of the Curie temperature with composition is followed for a number of continously varying systems. In addition, there is much magnetic data of technical interest concerning these oxides.

It is safe to say that this small book represents one of the most valuable additions to the subject of ferromagnetism since the volume of Becker and Döring appeared nearly 10 years ago.

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Nuclear physics in photographs: tracks of charged particles in photographic emulsions. C. F. Powell and G. P. S. Occhialini. Oxford, Engl.: Clarendon Press; New York: Oxford Univ. Press, 1947. Pp. xii + 124. $6.00.

One of the oldest and simplest techniques in nuclear physics which has been 'dormant" for many years has suddenly, through some important refinements, come to the forefront of the attention of physicists. Indeed, it has allowed, by the simplest methods, some of the most important postwar discoveries.

The history of the revelation of *tracks* in photographic emulsions is a very old one, going back to Kinoshita in 1909, but before its present blossoming, in part due to the new Ilford and Eastman emulsions, it had not given any results of importance comparable with those reached through the electrical methods of measuring, scintillations or Wilson Chamber.

The book under review shows in an exceedingly beautiful way what can be done at present with photographic emulsions. In this respect it is comparable to the Atlas of Wilson Chamber pictures by Gentner, Maier Leibnitz, and Bothe.

A sequence of striking pictures of nuclear phenomena as revealed by the technique of the tracks in photographic emulsions is used to illustrate an elementary course in nuclear and cosmic-ray physics, but this arrangement and the well-written text is only, one feels, a convenient frame to illustrate the technique.

The climax is reached in plates 42–48, in which evidence is given for the new π mesotrons recently discovered with this technique by a group of physicists, including the authors of this book.

The book contains sufficient technical information to instruct on the methods of use of the photographic plates, which are now commercially available, and, if only for this reason, it is a "must" for every research nuclear physicist.

The reproduction of the photographs and the typographical presentation are excellent—a most important feature for a book of this kind.

E. SEGRÈ

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Techniques in experimental electronics. C. H. Bachman. New York: John Wiley; London: Chapman & Hall, 1948. Pp. vii + 252. (Illustrated.) $3.50.

Asked individually what they would expect to find in a book entitled *Techniques in experimental electronics,* 10 well-qualified persons, including physicists, radio engineers, electronic research engineers, and graduate students in physics, all thought that such a book would include vacuum tube circuits, discussions of electronic measurement methods, and the many other techniques familiarly known as electronic gadgeteering.

C. H. Bachman's book of the above title is, instead, a very good handbook of high-vacuum techniques and of the laboratory arts useful to those who build experimental electron tubes and related electron and ion systems.

One must consequently conclude that the title of the volume is badly chosen, despite the technical justification for the name offered in the introduction. Undoubtedly, many will purchase the book and find it of little use, while others having need of this material will pass it over.

Slightly more than half of the book is devoted to high-vacuum techniques, chapters including pumps, traps and baffles, vacuum gauges, valves and controlled leaks, demountable joints, controls and gadgets, vacuum system techniques, leak detection, and metal versus glass vacuum systems. Other chapter headings are glass-blowing fundamentals, sources of charged particles, utilization of charged particles, assembly and processing of electronic devices, and miscellaneous hints and techniques.

The treatment of high-vacuum techniques is simple and direct and filled with useful practical facts. Gauges are covered a little too sketchily for a novice in the field, and little is said of the temporary vacuum systems utilizing spherical ground joints and flexible tubing, now gaining wide acceptance.

The sections on filaments and cathodes, on electron guns and electron optics, and on ion sources are adequate

and well written. The data on fluorescent screens is outstandingly good.

It is unfortunate that the rubber sheet and the electrolytic tank methods for experimental determination of electrode shapes have been omitted.

Techniques in experimental electronics is directly comparable to the well-known book by Strong, *Procedures in experimental physics.* Strong's book covers a very wide field of techniques quite adequately but is in consequence a little spotty. It has also become a little obsolescent in 10 years without revision. Bachman's book is fresh, concise, and coherent, but limited in scope.

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Radar beacons. Arthur Roberts. (Ed.) (Massachusetts Institute of Technology Radiation Laboratory Series.) New York-London: McGraw-Hill, 1947. Pp. xx + 489. (Illustrated.) $6.00.

Radar beacons, the third volume in the 28-volume Radiation Laboratory Series, summarizes the work of Division 7 of the Radiation Laboratory during the war, and it is believed to be the only book on this subject ever written. L. A. Turner was head of this division, with A. Roberts and M. D. O'Day serving as group leaders. The book lists 8 additional members of the editorial staff and 21 additional contributing authors. It is well illustrated with 246 figures, including numerous block and circuit diagrams and many photographs of complete beacon systems.

The volume is divided into four parts: (I) Basic Considerations, Chapters 1–6; (II) Beacon Design, Chapters 7–16; (III) Interrogator and System Design, Chapters 17–19; and (IV) Beacons in the Field, Chapter 20. Approximately one-quarter of the book is devoted to Part I, one-half to Part II, and one-quarter to Parts III and IV. The book is thus intended primarily for design engineers rather than for operational staff. For example, the amazingly large number of military uses of radar beacons are mentioned only briefly. Presumably much of this information is still classified. For all radar engineers, as well as for the highly specialized beacon engineer, the book would seem to be indispensable, since a radar designed without a full appreciation of beacon problems can hardly be expected to give completely satisfactory beacon performance. Most radars, whether ground, ship, or airborne, have found increased usefulness when provision is made for beacon operation.

The first chapter, written by L. A. Turner and A. Roberts, describes the uses of beacons. Though brief, it is a remarkably clear account of the way radar beacons were adapted during the war, first to defensive operations (submarine hunting) and later to offensive operations (strategic and tactical bombing). From the many uses of beacons one must indeed agree that "they also serve who only stand and wait."

The 5 remaining chapters of the first part treat such basic considerations as range, coverage, frequency, coding, and traffic capacity. The next 10 chapters, forming the second part, consider in detail the design of the many radar components peculiar to beacons, such as discriminators, coders, and special types of transmitters, receivers, antennas, and control devices. Chapters 17 and 18 are devoted to interrogator design and would be of particular interest to engineers designing radars. Chapter 19 describes complete beacon systems now available and the performance to be expected of such complete systems, while the final chapter discusses the installation, operation, and maintenance of beacons.

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Vacuum tubes. Karl R. Spangenberg. New York-Toronto-London: McGraw-Hill, 1948. Pp. xvii + 860. (Illustrated.) $7.50.

This is an excellent textbook for early graduate or late undergraduate study of vacuum tubes—of vacuum tubes alone. Circuits and gas phenomena are hardly mentioned, but the treatment of vacuum tubes, from diodes, triodes, tetrodes, and pentodes through cathode-ray tubes and photocells to klystrons, magnetrons, and "special" tubes is modern and penetrating.

The author says in the preface: "It is hoped that the view taken will be acceptable to both physicists and engineers." It should be, because the book is a reflection of the continuous struggle between the analytical and the experimental methods of advancing the subject matter. For example, in the chapters on "Determination of Potential Fields" and "Laws of Electron Motion," analytical expressions, which include relativistic masses and energies, are developed for the trajectories of charged particles in comparatively simple cases of electric and magnetic field configurations. Then, in order to handle the complicated electrode structures, those overbelittled "ingenious gadjets" are described, such as elastic-membrane and current-flow models and the graphical methods for determining electron paths. Theory and experimentation follow each other in this book just as they do in the development, design, and use of vacuum tubes.

After considerable attention to the physical principles, emphasis is shifted to the design and utilization of the tubes. There are numerous nomographs, design charts, field configurations, and a chapter on high-vacuum practice. There are 216 problems and excellent references to books and original papers to provide stimulus to the student. The rationalized MKS system of units is used throughout.

The book is especially outstanding for its chapters on Tetrodes, Pentodes, Tube Noise, Klystrons, and Magnetrons. There is much material presented here in textbook form for the first time.

The index seems to be too brief. Mention of Hull and Williams in connection with the early work on the screen-grid-tube seems to be missing. But the book is largely free from errors and the format is excellent. It is the second in the publisher's "Electrical and Electronic Engineering Series," the first of which is the well-known text, *Radio engineering,* by F. E. Terman.

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