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are open to doubt. In a book of 400 pages there should have been space for a careful and critical discussion of the still open question, whether the relativistic field theory of mesons and nucleons has any relevance to the real world.

To avoid misunderstanding, I should like to add that my favorable opinion of Volume 2 is not changed by the failure of Volume 1. In style and subject the two volumes are completely different. In Volume 2 the authors argue warmly in favor of the practical usefulness of meson theory. They are obviously enthusiastic about it. But they are not uncritical.

Hochvakuum-Elektronenröhren. Vol. I of Physikalische Grundlagen. By H. Rothe and W. Kleen. 297 pp. (Akademische Verlagsgesellschaft, Germany) Academic Press Inc., New York, 1955. \$8.33. Reviewed by M. W. Muller, Varian Associates.

This is the first of four books comprising an extensive revision of the well-known classic on vacuum tubes. It is to be followed by volumes on Vacuum-Tube Characteristics, Input Amplifiers, and Interference Phenomena.

Since the publication of the earlier version of this work (1940-41) the field of vacuum-tube technology has made enormous strides; in particular the emphasis on high-frequency applications has led to a heavy concern with tubes of the disc-seal and electron-beam varieties. The present volume does justice to the physical background material called for by these advances; the inclusion of the new material justifies the increase in the total length by a factor larger than two.

The only portions of the book that have been taken over from the earlier work without extensive changes are the chapters on secondary electron emission and on the laws of the diode. Even here, however, new sections have been added to give a treatment of spherical electrode geometry, so important in the design of modern electron guns. By the inclusion of tables and graphs of numerical values of current relations and transit times the authors have succeeded in making these portions of their book a self-contained and readable encyclopedia of the diode.

The chapters on electrode field calculations, amplification factors, interelectrode capacities, and current division in multi-electrode tubes have similarly been enlarged so as to include an adequate compendium of information for the designer of vacuum tubes. Especially noteworthy are the discussions of numerical and analog methods for solving Laplace's equation, the remarks (pp. 104-107) on characteristic properties of plane and axially symmetric fields, and the tabulations and graphs of simplification factors.

The chapters on electron trajectories, optics, and beams are essentially new, and provide a usable outline of these topics for the vacuum-tube engineer. The coverage here is somewhat less comprehensive, but enough detailed information is included to make the treatment useful as a reference as well as a textbook. One finds,

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HIGH SPEED PHOTOGRAPHS OF NUCLEATE BOILING were first taken at JPL using a special camera fitted with a Kerr cell shutter. Sequence photos, taken at speeds up to 20,000 frames per second, were the first series of high-speed, high-resolution motion pictures to successfully stop the action of nucleate boiling.



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As a result of knowledge gained from the high speed photos and from subsequent work, the role of bubble dynamics has been incorporated into theories of nucleate boiling heat transfer which is the principal mode of heat transfer encountered in the regenerative cooling of liquid propellant rocket motors.

Because of the very high temperatures encountered in propellant combustion, JPL has been engaged in a broad program studying various modes of heat transfer. Emphasis has been placed on studies of boiling heat transfer to liquids, turbulent boundary layer heat transfer to deLaval nozzles, nonsteady heat transfer due to oscillatory flow, and heat transfer with chemical reaction in the boundary layer and on the surface.

The influence of chemical effects is one of several programs that has benefited from the association of talents and experimental techniques from several different fields of specialization. The broad and varied programs, ranging from laboratory experiments to responsibility for missile flight testing, have created unique working conditions for our technical personnel.

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in these chapters, a treatment of thermal velocities, and a discussion of hollow electron beams. There is some mention of the effects due to positive ions, but the two pages devoted to the subject are too sketchy to be of real value.

The bibliography, which appears appropriately divided at the end of most chapters, is excellent and will be of great value to the user. It includes entries up to the early part of 1955, a tribute to the efficiency of the publishers, who are also to be congratulated on the quality of the printing and illustrations.

The book admirably fulfills its aim to be an advanced text and short encyclopedia of the physical principles of vacuum tubes. It merits and will undoubtedly enjoy the popularity of its predecessor.

Principles and Applications of Physics. By Otto Blüh and Joseph Denison Elder. 866 pp. Interscience Publishers, Inc., New York, 1955. \$7.00. Reviewed by T. Teichmann, Lockheed Aircraft Corp.

The author of this book has produced a most ambitious essay, an elementary and yet "comprehensive and coherent" account of physics and its applications. Almost every topic within the entire gamut of modern and classical physics is touched on and the index alone contains thirty pages. The only significant subjects not mentioned are quantum electrodynamics, magneto hydrodynamics, ferrites, plasticity, and shock waves, and one could hardly make a strong case for including these in an elementary book, though the same remark might well be applied to many of the topics which are included.

To the person with some technical background this book could serve as an interesting and informative summary, but the reviewer takes leave to doubt whether the average tyro could ingest, let alone digest, the contents, particularly if his chosen field is not physics. On the other hand, a discriminating selection from this volume would probably prove very attractive even to a newcomer, particularly because applications are discussed in connection with each topic. These are non-trivial and yet closely related to one's daily life; e.g., those related to the human organs, including blood circulation, metabolism, hearing, and vision.

The book concludes with a section on the significance of the physical sciences. This includes a discussion of the philosophy of science in general, the contents of the physical sciences, physics teaching and research, and a philosophical disquisition on physics and the cultural sciences. Philosophical remarks by scientists are almost always misunderstood by nonscientists, and the reviewer feels that this chapter serves no useful purpose, since it repeats the time-worn arguments that erect straw technocrats merely to demolish them!

The format is clear and the style fairly easy, though not entirely free of some of the Germanic syntax presumably inherited from an earlier draft. The book should serve as an interesting review of elementary