the author brings together material he has presented at society meetings and in various journals on certain aspects of cybernetics, with special reference to the relation between information and organization. The book is unfortunately not well organized and gives the impression of being a series of rather disconnected essays put together with not sufficient concern for the logical development of the ideas. The style and level of difficulty are very uneven: some sections are popular in character and can probably be understood by those with limited attainments in mathematics and physics, while others demand a considerable acquaintance with the fundamentals of thermodynamics.

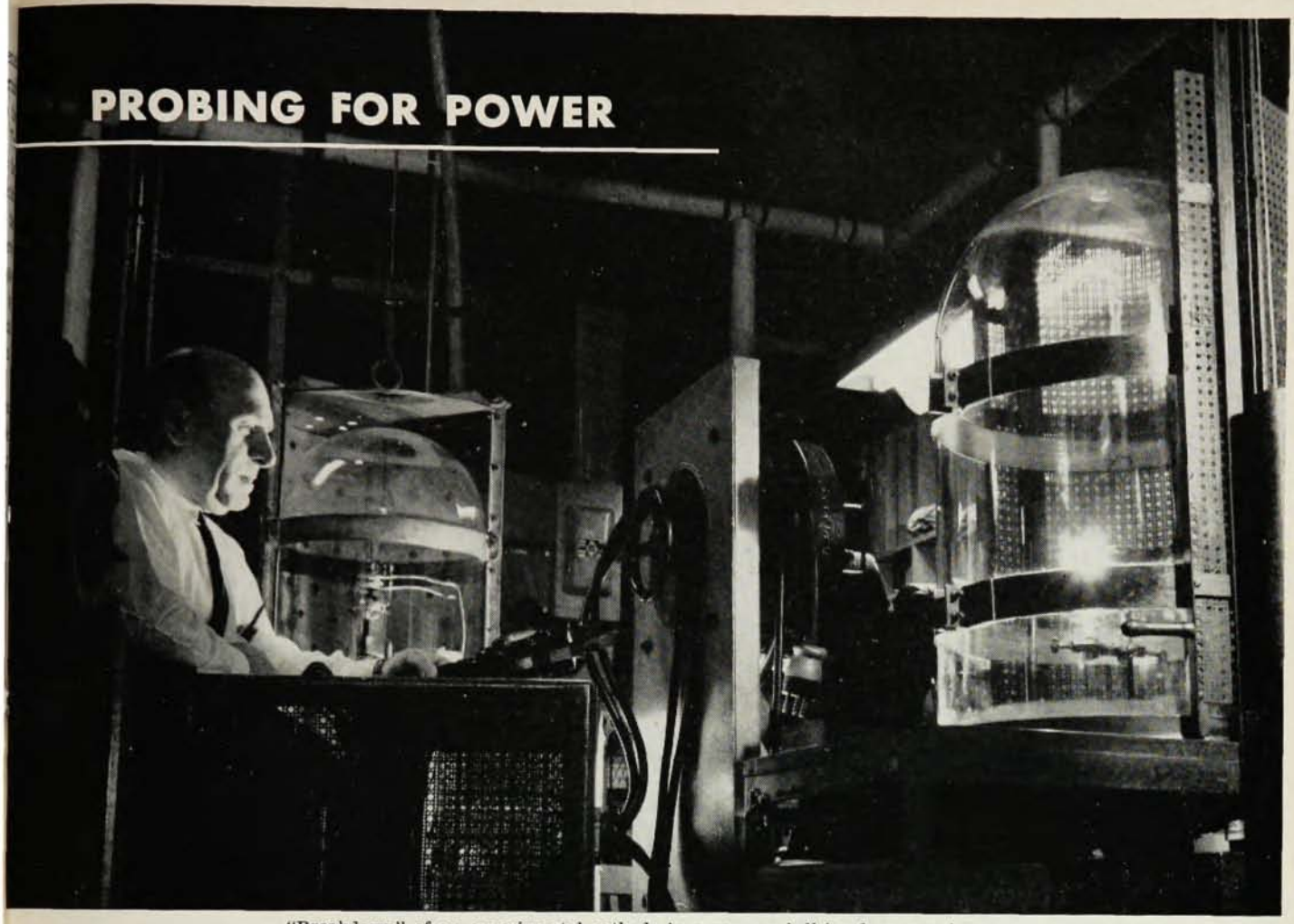
The stress which the author lays upon the connection between communication and organization and the role of entropy in the description of both is interesting though not entirely novel. He has a good section on the interpretation of scientific theory as the organization of observation. His comments on the possible application of information theory to the biological and behavioral sciences are tentative and hardly profound. The book would certainly have been more valuable to all those interested in the field had the author been willing to arrange his presentation more carefully and document his ideas in greater detail.

The main text is preceded by a lengthy foreword (96 pages) by C. A. Muses, which appears to have little relevance to the theme of the book and the presence of which in such a volume is somewhat difficult to understand.

Concepts of Classical Optics. By John Strong. 692 pp. W. H. Freeman & Co., San Francisco, Calif., 1958. $9.50. *Reviewed by C. C. Kiess, National Bureau of Standards.*

One who has been brought up on such textbooks as Preston's *Theory of Light*, Drude's *Lehrbuch der Optik*, or Wood's *Physical Optics*, wonders what a new book, designed as "an intermediate course in optics", has to offer in the way of novelty in a field for which a half-dozen, or more, books are now available. Since "some familiarity with electricity and magnetism, at the intermediate level, and some knowledge of calculus, vectors, and complex numbers are prerequisite", one wonders further at what stage of intermediacy a student is ready for Professor Strong's book. To one so prepared the book has much to offer.

In the first two preparatory chapters light is introduced as a wave phenomenon of which the analytical properties are derived. In the third chapter one learns that the particular waves, applicable to optics, are those by which a disturbance is propagated in an electromagnetic field in accordance with Maxwell's equations. These are transverse waves which, in their interaction with matter, account for the main features of physical optics, namely: "reflection and refraction; velocity and dispersion; polarization and crystals; and finally, interference and diffraction". These properties of light flow as logically from the field equations as do those of



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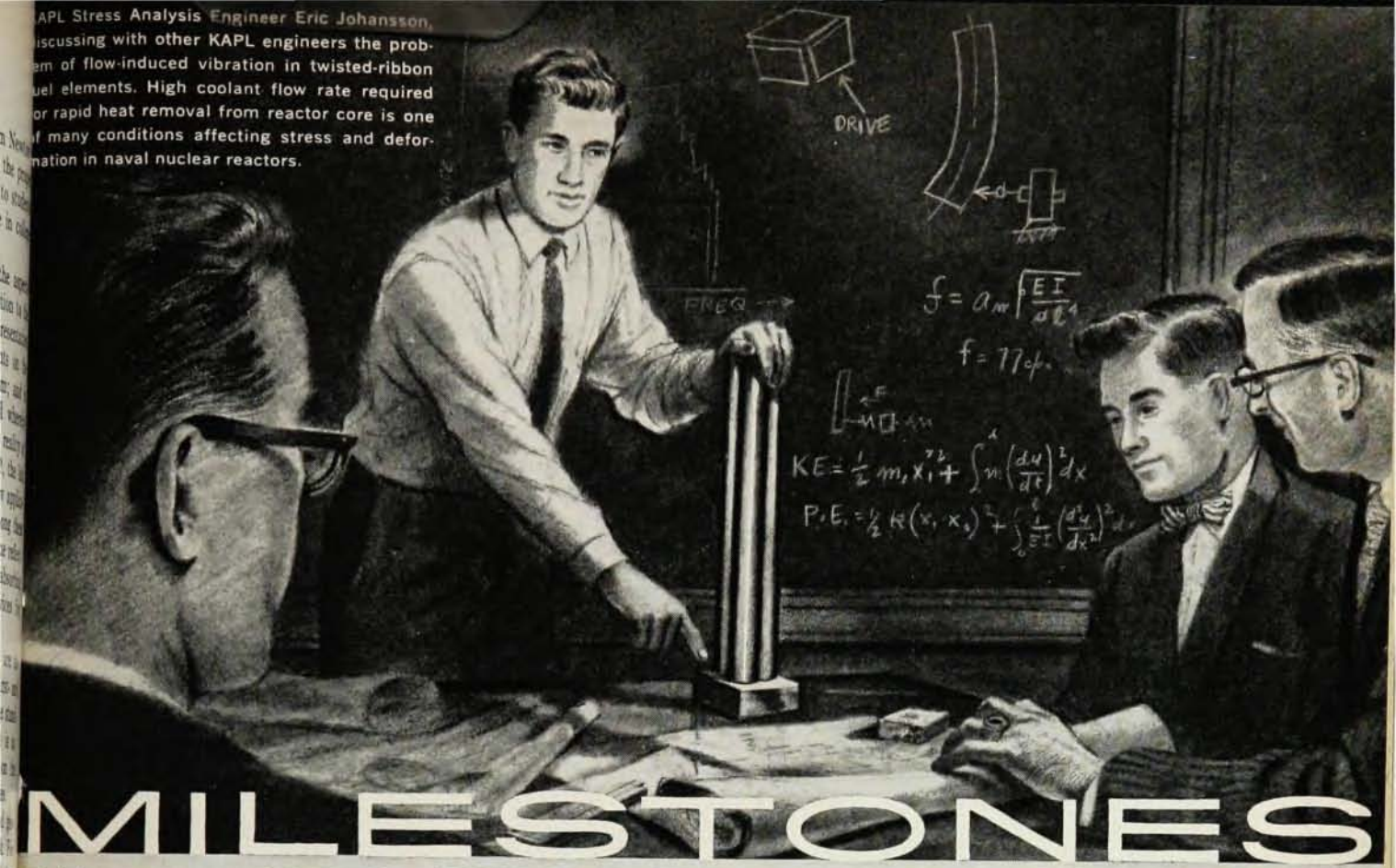
planetary motion, in celestial mechanics, from Newton's law of gravitation. To this reviewer this is the proper way to present the subject matter of optics to students who are going beyond the beginning course in college physics.

The nine succeeding chapters deal with the aspects of physical optics mentioned above. In addition to the standard treatment of these topics the presentation includes illuminating comments and sidelights on the history and personalities associated with them; and in various instances experiments are described whereby the student may demonstrate for himself the reality of phenomena discussed in the text. Chapter 12, the last in the group on physical optics, describes new applications of "old and established principles". Among these are methods for reducing and for enhancing the reflectance of optical surfaces; special films for absorbing or transmitting limited bands of light; devices for changing the phase of light waves; and others.

The remaining chapters, 13 to 16 inclusive, are devoted to geometrical optics. The principles of first- and third-order imagery are derived according to the standard procedures; and here, also, the exposition is accompanied by comments and practical hints on the purposes and uses of the various optical devices.

The sixteen chapters devoted to physical and geometrical optics comprise 368 pages of the book. For each chapter a set of problems is provided, just before the index, "to serve as work incentives for the serious student", and to assure him "of a full understanding of the material covered in the text". Appended to the main part of the book is a group of seventeen articles for which 288 additional pages are required. These articles are by various authors and deal with recent developments in and beyond the fields covered by the classical concepts. Although they are an invitation to the student to venture further into the application of optical methods to various modern problems, yet these articles may be read with profit by oldsters who may have felt that optics has advanced little, if at all, beyond the point reached in their day. To show the nature and scope of these articles they are listed as follows:

(A) Applications of Interferometry by W. Ewart Williams, (B) Interferometers by J. Dyson, (C) The Kösters Double-image Prism by J. B. Saunders, (D) Interferometry with Savart's Plate by A. C. S. van Heel, (E) Apodization by Pierre Jacquinot, (F) Application of Fourier Transformations in Optics: Interferometric Spectroscopy by George A. Vanasse and John Strong, (G) Some Modern Concepts of Light by L. Witten, (H) The Speed of Light by C. Harvey Palmer, Jr., (I) Radiation Detectors and Measuring Devices by Harold W. Yates, (J) Microwave Experiments and Their Optical Analogues by Gordon Ferrie Hull, Jr., (K) The Wave Theory of Microscopic Image Formation by F. Zernike, (L) Modern Trends in Methods of Lens Design by M. Herzberger, (M) Graphical Ray Tracing by E. W. Silvertooth, (N) Fiber Optics by Narinder S. Kapany, (O) Optical Filters by Robert



APL Stress Analysis Engineer Eric Johansson, iscussing with other KAPL engineers the prob- em of flow-induced vibration in twisted-ribbon uel elements. High coolant flow rate required or rapid heat removal from reactor core is one f many conditions affecting stress and defor- nation in naval nuclear reactors.

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Eric B. Johansson is one of approximately twenty Stress Analysis Engineers working on naval reactors at KAPL. Eric joined G.E. in 1951 following graduation from the California Institute of Technology and graduate study at UCLA. He has completed advanced study in engineering analysis as a graduate of G.E.'s Advanced Engineering Program and has taken additional graduate work at Rensselaer Institute of Technology under G.E.'s Tuition Refund Program.

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G. Greenler, (P) Diffraction Gratings by R. P. Madden and John Strong, (Q) Mathematical Review by Trevor Williams.

The make-up of the book—its composition and typography, the illustrations, the quality of the paper—are all in keeping with the high standard achieved in the text. However, a few criticisms may be made. In a book of this kind, requiring much mathematical formulation, the question of symbols is important, and if the choice is limited it is almost inevitable that some symbols must do double duty. To avoid ambiguity it is desirable, therefore, to restrict the various styles of type to various classes of magnitudes; for instance, Greek letters for angles; lower-case italics for ratios, constants, and other scalar quantities; bold-face Roman letters, preferably without serifs, for vectors; etc. Unfortunately, such a plan has not been followed in this book, and we see, for example, the letter *r* used to designate a ray, a radius, and an angle; **h**, $\boldsymbol{h}$, and h used for Planck's constant; lower-case bold-face Roman letters for the unit vectors, for the speed of light, and for Boltzmann's constant; and italic capitals, capped with a macron, for the field vectors. All this is confusing to a reader and could be avoided if writers of physical mathematics could agree on a standardized scheme of notation. Finally, it is suggested that on page 168 the words "nuclear reactor" replace the word "cyclotron".

Books Received

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