

great theoretical generality although the author's proof of Irving Langmuir's thermal limit, given in the appendix, clears up many points that have given a generation of students difficulty and should be much more widely known. Moreover the book presents the best and most complete description of a successful semiempirical approach to a difficult engineering problem for which the scientific foundation is incomplete and, as such, presents an interesting "case study" for a course in methods of applied physics.

The book should be in the collection of anyone working in applied electron optics and on the shelf of any reasonably complete electrical-engineering library.

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J. Arol Simpson is chief of the Electron Physics Section, National Bureau of Standards. He says that he has "been trying to design electron guns with only mixed success for the last 20 years."

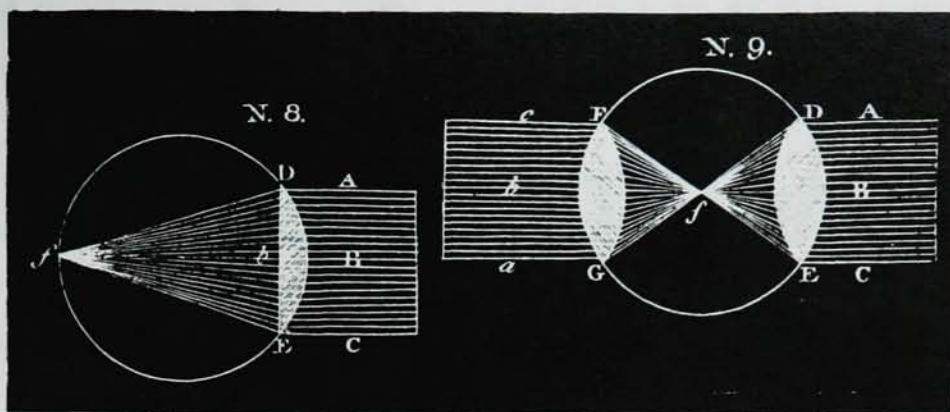
Image watching

IMAGES OPTIQUES. (4th Edition)
By Pierre Fleury, Jean-Paul Mathieu.
614 pp. Eyrolles, Paris, 1968.
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by JACQUES ROMAIN

Pierre Fleury is the head of the Institut d'Optique, and Jean-Paul Mathieu is a professor at the Faculté des Sciences of Paris. Their *Physique Générale et Expérimentale*, an eight-volume textbook, is one of the leading general physics treatises, at the university level, in the French language. Of the eight volumes, two are devoted to optics. The second of these, titled "Lumière" (Light), deals in detail with a qualitative and quantitative study of light, with its propagation conditions in various media, with emission and absorption spectra and with the optical phenomena pertaining to geophysics and astrophysics. The present book, which is meant as the first of the two volumes on optics, has to do with all the aspects of image formation, understood in a broad sense.

It begins with fundamental notions on light beams, reflection, refraction, light waves and the nature of light and on the perception of images. The text is then divided into three parts: The first deals with the elemental optical



200 YEARS AGO *Encyclopedia Britannica* showed with figures how light passed through plano-convex and convex-convex "glasses" to converge and form optical images.

systems, plane refracting interfaces, prisms, thin lenses, thick optical systems, aberrations, birefringence and the polarization related to it. Light rays at a small angle with the optical axis and the contrasting large aperture are both studied.

The second part is devoted to interference and diffraction and their application to image-forming problems, for example, interferometry, phase contrast, gratings and holography (a noteworthy addition to this new edition). The last part deals with the various optical instruments, including photography, and ends with short notes on the construction of optical apparatus. Two more features of the new edition are an exposition of convolution relationships between object and image and the use of Fourier transforms in the theory of diffraction gratings.

The emphasis is on the interrelation rather than the differences between "geometrical" and "wave" optics, and the approach is decidedly experimen-

tal even though elaborate formulas are derived when needed. The exposition is profusely interspersed with descriptions of experiments, both for the classroom and simple ones for every reader without specialized instruments.

These experiments are either experimental demonstrations of properties mentioned, or illustrations of the descriptions in the text. Also mentioned, at every possible occasion, are examples of practical uses of the properties or systems considered. The exposition is quite clear, precise, and concise.

A generous supply of figures and plates makes the text self-explanatory, and a satisfactory subject index is provided. Each chapter concludes with a good many exercises, the answers to which are collected at the end of the book.

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The reviewer taught general physics in highschool and theoretical physics at the University of Elisabethville in the Congo.

Cryostat design

EXPERIMENTAL TECHNIQUES IN LOW-TEMPERATURE PHYSICS, (2nd Edition) by Guy Kendall White. 397 pp. Oxford U. Press, London, 1968. \$12.00

by HARMON H. PLUMB

In the preface to the first edition, Guy White states that his purpose was "to meet the need for a book which gives details of designing cryostats, filling them with liquid helium, maintaining and measuring various temperatures." The author, in an exemplary fashion,

has conveyed most of the important experimental cryogenic techniques. With the reader in mind, White has clearly expressed the techniques and the basic ideas involved without delving into intricate details of specialized apparatus. Appropriately he has provided pertinent references for those who may desire to pursue experimental or apparatus details. The first edition was published in 1959, and this second edition is sufficiently up to date to cite literature of 1966 and