ment is directed at the probabilistic applications, with extensive discussion of infinitely divisible processes, random variables, and positivity. There is also an interesting treatment of some of Bochner's own work on summation formulae and "modular relations".

The final part of the book is concerned with characteristic functionals and stochastic processes. These characteristic functionals are related to stochastic processes in an analogous way to the relation between characteristic functions and their corresponding random variable and Bochner introduces some of the basic steps in carrying this similarity further (e.g. generating functionals).

While the material is rather abstract, the style is kept lively, and, in fact, almost conversational, and it will certainly prove most valuable to anyone working in the field. The format and printing are also excellent and the book sets a high standard for future "California Monographs in Mathematical Sciences", of which set it is the first member.

Recent Advances in Optics. By E. H. Linfoot. 286 pp. The International Series of Monographs on Physics, Oxford University Press, New York, 1955. $8.00. *Reviewed by V. Twersky, Electronic Defense Laboratory, Sylvania Electric Products Inc.*

A basic problem of instrumental optics is specifying the "best image surface" for a given optical system and object. In the first chapter this problem of selecting the surface that minimizes the various aberrations is first considered on a geometrical ray basis. Analytical approximations (with error terms in powers of the angular diameter of the image field) are derived, and applied to such questions in "aberration balancing" as: "What amounts of residual Gauss and Seidel aberration will give the smallest rms image radius over the best spherical field surface of a monochromat with specified Schwarzschild aberration coefficients?" Then the effects of diffraction at the exit pupil are discussed on the basis of Huygens' principle. The first chapter ends with a treatment of images of "partially coherent object surfaces". This concept is particularly important in microscopy, since light from an incoherent source is partially coherent after reflection or transmission, the "coherency" arising from effects at the observation point traceable to a common element of the original source. (The problems here are quite similar to some in communications theory.) The final pages of this section treat the phase-contrast microscope.

Chapter 2 uses Huygens' principle to develop a general theory of the Foucault knife-edge test. Because of its simplicity, and one's intuitive interpretation of the mirror's appearance as a perturbed plane under grazing illumination, this ninety-year-old test is still the most widely used check for astronomical mirrors, etc., during "figuring" (shaping) by optical polishing. The analytical problem is essentially that of the diffraction of a perturbed spherical wave front converging to a focus near the edge of a half plane.

The geometrical theory of the Schmidt camera, a reflecting telescope with a shaped transparent disk that distorts the incident field to "precorrect" for spherical aberration of the mirror, is given in Chapter 3. The final chapter treats plate-diagram analysis, a geometrical ray technique which essentially represents each surface of a lens system by an equivalent spherical surface plus an astigmatizing corrector plate (the plate being imaged in the part of the system which precedes it).

The content of the monograph, as it pertains to certain advances in the theory of instrumental optics during a twenty-year period ending in 1953, is excellent; and it will prove useful to specialists in the field to have the original work of the author, as well as accounts of work by Zernike, Wolf, Hopkins, Wayman, Burch and others, under one cover. However, the title is somewhat too inclusive since, for example, no mention at all is made of the concurrent advances in rigorous treatments of diffraction problems or in the "new ray optics" based on asymptotic solutions of Maxwell's equations.

It is regrettable that the work is so well aimed at specialists. The absence of introductory material may make it quite difficult for an outsider, say in radio astronomy, to attempt to carry over useful optical techniques to related problems of antenna design; in fact some sections read like patchworks of journal articles with the introductions deleted. The most readable chapter is that on the Schmidt camera and this is due largely to its excellent introductory discussion and its clear statement of the problem involved.

Reports on Progress in Physics. Volume XVII. Edited by A. C. Stickland. 280 pp. The Physical Society, London, England, 1954. Nonfellows, £2, 10s.; fellows, 27s. 6d. (Postage 1s. 6d.) *Reviewed by E. R. Cohen, North American Aviation, Inc.*

The seventeenth volume of this annual publication is made up of eight survey articles which well represent the present varied frontiers of physics.

C. J. Bouwkamp of the Netherlands contributes an extensive survey of classical diffraction theory which includes among other topics the Wiener-Hopf technique for the solution of integral equations, the rigorous formulation of Babinet's principle, and a discussion of spheroidal wave functions in diffraction theory. J. A. Chalmers reports on atmospheric electricity and B. H. Briggs and M. Spencer survey movements in the ionosphere obtained by radio methods.

C. W. Allen discusses the physical condition of the solar corona as it is understood today, and traces the development of this understanding from 1942, when Edlén identified "coronium" as highly ionized states of A, Ca, Fe, and Ni, thus providing the basis for a reasonable physical model. Atomic valance states and chemical binding are discussed by W. Moffitt and antiferromagnetism is covered by A. B. Lidiard.

Nuclear physics is represented by two reviews which span the range of activity in this field; E. Teller discusses the origin of cosmic rays, and M. H. L. Pryce surveys the evidence on nuclear shell structure.

The production of the book, as is usual in this series, is excellent; physicists in general have been acquainted with the *Reports* for so many years that such an observation is however probably superfluous. Individual articles reprinted from the *Reports* are available at prices which vary according to their length. Information on this may be obtained directly from the offices of the Physical Society of London.

Optical Properties of Thin Solid Films. By O. S. Heavens. 261 pp. (Butterworths Scientific Publications, England) Academic Press Inc., New York, 1955. $6.80. *Reviewed by S. F. Singer, University of Maryland.*

The large strides which have been made recently in the techniques and applications of thin films have gone hand in hand with the developments in vacuum technique and electron microscopy. The former has been used to improve the methods of film deposition while the latter has been used to obtain information hitherto unobtainable about the physical properties of films. The subject of thin films has become increasingly important also because of its practical applications in optics. While partly transparent, highly reflecting metal films were used in the Fabry-Perot interferometer over 50 years ago, the technique has developed to an amazing extent so that films of very great complexity and of controlled thickness can now be deposited quite accurately. The construction of complicated multi-layer systems of films, both metal and dielectric, has now become a common adjunct in physical research. Thin films find their applications in anti-reflecting systems which may use a single film, a double film, or even a triple film. The effectiveness of this technique is remarkable: an instrument with 20 untreated optical surfaces would have a light transmission of only 32% but with the use of the three layer anti-reflecting system this figure could be increased to 98% for the visible spectrum. In other applications high efficiency reflecting systems are of importance. Here advances have been made by the use of systems of dielectric layers having different indices of refraction. These are applied in controlled thicknesses, generally $\lambda/4$ optical thickness. Such all-dielectric reflecting films can give considerable improvement in the performance of certain instruments, e.g. a Fabry-Perot interferometer. It results in a small fringe width and, therefore, an improved resolution. Also, the transmitted light intensity is much greater than it would be with the use of a metal film reflector, e.g. a silver film. Of particular interest in many fields of spectroscopy and astrophysics is the use of deposited films to construct interference filters. These multilayer films cannot yet compete with polarization filters when it comes to extremely narrow band widths, but they should be useful for a band width of about 20 Å, while a polarization filter can be built for a band width of the order of one Å.

The present volume reviews the work which has been