adds the squares of the sums of the components of the amplitudes, is simple and applicable to many other diffraction problems as well. The diffraction pattern of a double slit and of a circular opening could have been simplified by the use of this method.

Too much is made of the fact that unpolarized light is not *actually* composed of the superposition of many linear component vibrations. Of course this is no more true than that the components of any force are really present in the force. It seems fruitless to discuss what is actually true in physical concepts. It is better to consider the extent to which the concept is useful, for example, that of rays in geometrical optics, waves in physical optics, wavelets in diffraction theory and photons in the quantum theory of light.

The introduction of an impossible cylindrical wave in the treatment of diffraction by a slit is certainly inconsistent with reality. As a matter of fact, one encounters here a two-dimensional integration over a plane or any other surface that one may choose. The integration in the direction of the length of the slit is carried out first and gives only a constant factor, while the integration across the slit leads to the characteristic result which is conveniently discussed with the aid of Fresnel integrals or Cornu's spiral.

In the chapter on double refraction it is stated that the double refraction of Cellophane is due to strains introduced in its manufacture. It should be more widely known that non-crystalline, strain-free materials are doubly refracting if they have a sub-microscopic structure, for example, fibrous or lamellar. Because of this fact, the polarizing microscope finds a useful application in the grading of cotton fibers, as well as in the study of the structures of various other plant and animal fibers and membranes.

The material in the chapter on color is not consistent with the best of modern practice in colorimetry, apparently because too much of it was taken from the older literature. The idea of desaturation by the addition of black is of no value in the measurement of color. The author makes reference to Hardy's excellent Handbook on Colorimetry, but does not use it to the fullest advantage.

The reviewer considers this to be the best book in its class, one for which there is a great need. In the intermediate optics laboratory it is desirable to include experiments in geometrical and physical optics and in spectroscopy without entirely losing sight of the underlying theory. This makes the field so broad that one has to select the subject-matter carefully, and it is not easy to satisfy a large number of teachers. Professor Monk has done very well indeed in this respect and has made a valuable contribution to optical literature.

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STATISTICAL AND MATHEMATICAL PHYSICS

Statistical Physics. By L. LANDAU and E. LIFSHITZ; translated from the Russian by D. SHOENBERG. Pp. viii + 234, Oxford University Press, 1938.

THIS book presents the results of thermodynamics obtained by consideration of statistical methods. Instead of taking the first and second laws of thermodynamics as fundamental first principles, the thermodynamic relations are derived from the atomic properties of the systems concerned. Thus we have presented in a uniform manner two subjects which, although their intimate relationship has long been recognized, are usually divorced, and treated in separate text-books.

The authors confine themselves to those phenomena not connected with quantum effects. After a discussion of the fundamentals of statistics, they proceed to derive the usual thermodynamic functions and the gas laws. Then there are chapters devoted to chemical potentials and chemical reactions, phase equilibria and the properties of solutions. These are followed by a chapter on anisotropic bodies, which is based largely on original work of Landau. The book is completed by a discussion of surface phenomena, the whole forming a well-ordered and well-presented exposition.

No doubt the authors will be criticized for the statement in the preface, "no attempt has been made at mathematical rigor, since this is anyhow illusory in theoretical physics, but we have instead tried to make clear the fundamental physical assumptions on which the results are based." Nevertheless, the statement furnishes an excuse for such matters as the definition of probability as the limit of a ratio which approaches no limit in the rigorous mathematical sense and the omission of any discussion of the ergodic hypothesis. The clarity of the exposition as a whole, however, should largely condone such imperfections.

A more serious objection can be made to the complete lack of any numerical magnitudes of the quantities under discussion. Although there are examples interspersed throughout the text, they consist largely in the derivation of less important consequences of the theory. The comfortable feeling that one gets from knowing that the heat of vaporization at the boiling point is 539 calories per gram for water, but only 2.7 calories per gram for methyl alcohol is completely lacking. This, to be sure, is purely a matter of opinion, and the text could certainly be supplemented in such a way as to correct this, if it were desired. Altogether, the book is excellently done and would represent a valuable addition to any one's library.

Methoden der Mathematischen Physik. By R. COURANT and D. HILBERT, Vol. II, pp. xvi + 549, Julius Springer, Berlin, 1937.

PHYSICISTS will welcome the second part of this most

useful compilation. This volume deals with that part of the theory of partial differential equations which is important in relation to physics. The book is written primarily from a mathematician's point of view, developing the subject of partial differential equations in a systematic way, and then proceeding with the application of the theory to the problems of physics. Among the physical problems discussed are heat conduction; plane waves, Huyghens' principle and the optics of crystals; the Hamilton-Jacobi equation; the telegraph equation; and potential theory and hydrodynamics. There is also a valuable section devoted to Heaviside's method of operators.

The last chapter deals with boundary and *eigenwert* problems from the point of view of variational calculations. There is an indication that the mathematical methods discussed here will be of importance in the future perturbation calculations of the quantum theory. One wonders whether the present volume will have the almost prophetic nature of Volume I, which dealt extensively with *eigenwert* problems three years before the advent of wave mechanics.

Although, for the most part, the applications to physics are in rather neglected and unfashionable fields, the book should be in the reference libraries of all physical laboratories.

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THE CAMBRIDGE MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE British Association for the Advancement of Science this year held its annual meeting in Cambridge from August 17 to 24. This was the fifth time since its foundation that meetings of the association had been held in Cambridge, and the second time in the present century. The first Cambridge meeting was the third of the association, held under the presidency of the Reverend Adam Sedgwick in 1833. The association met again in Cambridge in 1845, when Sir John Herschel was president, and has since convened in 1862 under the presidency of the Reverend Professor Willis, and in 1904 under that of the Rt. Hon. A. J. Balfour.

Cambridge is in many ways a uniquely suitable setting for the association meetings. Situated as it is in the heart of the fen country, flanked by the chalk escarpment in the south and east, the western plateau south of Madingley along the Cambridge-Bedford road, and the fens in the north, it presents unique natural features of geographical and physiographical interest in addition to those of immense historical and more purely intellectual import for which it is more famous. It is likewise geographically extremely well centered for a great number of academic and industrial institutions of research and of learning in general, being especially readily accessible from the London and Oxford areas and reasonably convenient to the Midlands.

The inaugural meeting of the association was held on the evening of August 17, in the Regal Cinema, St. Andrews Street, at 8:00 P.M. This year's president of the association was the Rt. Hon. Lord Rayleigh, who had officiated as president of Section A in 1929. His address, entitled "Natural Vision and Vision Aided by Science," dealt with two rather sharply differentiated subjects—the extension of our sense of vision in the many ways which science has made possible and the degree of responsibility which the scientist must bear and the degree of censure from society as a whole to which he is justly subject, in connection with modern warfare. The address has appeared in SCIENCE for August 26 and September 2.

THE SECTIONAL MEETINGS

The association met, as usual, in thirteen sections, beginning on Thursday, August 18, and continuing throughout the time of the meeting.

The presidential address in Section A, given by Dr. G. C. Darwin in the Arts School on Friday, August 19, dealt with "Logic and Probability in Physics," part of which was printed in the issue of SCIENCE of August 19.

The sectional papers were characterized particularly by the symposium on nuclear physics, introduced by Niels Bohr, and to which contributions were made, among others, by Cockroft, Bothe, Dee and Feather. The central theme of the discussion was the Cavendish cyclotron and the uses to which it would be put, a study of excited states and of neutron-induced radioactivities in general. The mathematics portion of the section program was devoted very largely to a discussion of Newtonian root evaluations and a symposium on combinatorial mathematics in the design of experiments. A symposium on magnetic alloys and x-ray structure comprised the second major portion of the physics program, introduced by Bragg and participated in, among others, by Stoner, Bradley, Sucksmith and Oliver. Symposia on high-altitude cosmic radiation and low temperature physics, introduced respectively by Professor P. M. S. Blackett and Dr. H. G. B. Casimir, continued an unusually rich program, which