to be found is the proof of Thue's theorem (1908) that if $g(x, y)$ is an irreducible homogeneous polynomial of degree $n>2$ with integral coefficients, the equation $g(x,y)=a$ for a given integral value of a has only a finite number of solutions. The main purpose of this part is to develop as much of the theory of ideals which is necessary to establish the known results concerning Fermat's famous conjecture that the equation

$$x^n + y^n = z^n$$

has no integral solution x, y, z with $xyz \neq 0$ for $n>2$. In particular the proof of Kummer's theorem that the conjecture holds for $n=p$, a regular prime, is given in full. The concluding part deals with some recent results of Furtwängler (1912), Wieferich (1909), Mirimanoff (1910), and Vandiver (1914, 1919).

The mathematical world owes a great debt of gratitude to Professor Landau for rendering accessible so many of the recent splendid achievements in the theory of numbers.

G. D. BIRKHOFF

THREE BOOKS ON WAVE MECHANICS

Four Lectures on Wave Mechanics. By Erwin Shrödinger. London and Glasgow, Blackie and Son, 1928. viii+53 pp. Price 5 s.

Collected Papers on Wave Mechanics. By Erwin Schrödinger. Translated from the 2d German edition by J. F. Shearer and W. M. Deans. London and Glasgow, Blackie and Son, 1928. xiii+146 pp. Price 25 s.

Selected Papers on Wave Mechanics. By Louis de Broglie and Léon Brillouin. Translated by W. M. Deans. London and Glasgow, Blackie and Son, 1928. 151 pp. Price 15 s.

The wave mechanics proposed by de Broglie and Schrödinger has assumed during the short space of two years such a dominant role in the field of atomic physics that these three books in English by the authors of the new theory will be eagerly welcomed by physicists and mathematicians in England and America.

Schrödinger's *Four Lectures on Wave Mechanics* were delivered at the Royal Institution last March. In them are explained the ideas underlying the wave mechanics and some of the more important applications of these ideas. The exposition is somewhat popular in form, the mathematical details of computation being omitted from the text. The first lecture unfolds the relation between geometrical optics and classical dynamics as exhibited by the correspondence between Fermat's principle and the principle of Maupertuis (least action). It is this correspondence which suggests that classical methods are no more applicable to micro-mechanics than the ray methods of geometrical optics are to problems in diffraction and which leads in atomic problems to the substitution of a wave equation for the Hamilton-Jacobi equation of macro-mechanics. The success of a physical theory is measured by the agreement of its predictions with experiment, and in the succeeding lectures applications of the theory are made to the hydrogen atom (including the case of a nucleus of finite mass), the simple harmonic oscillator and the rotator. The physical interpretation of the ψ function proposed by the author is shown to lead to correct selection and polarization rules and to correct intensity ratios for the emitted radiation. Finally, the perturbation theory is developed and from it the dispersion formula is deduced.

The serious student of the new mechanics will find a complete account of the subject in the *Collected Papers*. These comprise practically all the author's papers on wave mechanics, including the one in which he shows the equivalence of his theory with the matrix dynamics of Heisenberg, Born and Jordan. With one exception all of them appeared in the *Annalen der Physik* and all were published during the two years 1926 and 1927. As the author remarks in his preface, the results contained in the later papers were unknown to him when the earlier ones were written, and consequently the development is not as logical as it might be made if the book were rewritten in the light of his present knowledge. Nevertheless his exposition of the subject will probably appear clearer to the reader than those contained in several books which have been hurriedly thrown together by others in the attempt to supply the demand for information on the new theory.

Schrödinger's ideas originated in those of de Broglie, who was the first to suggest that material particles might have the properties of a wave group. The *Selected Papers on Wave Mechanics* include several of the fundamental papers of de Broglie as well as papers by Brillouin on both the matrix dynamics of Heisenberg and Dirac and the wave dynamics of de Broglie and Schrödinger. The last paper in the series contains a valuable comparative study by Brillouin of the classical Bose-Einstein and Fermi-Dirac statistics.

These three volumes taken together provide an excellent exposition of those theories of atomic physics which have proved most successful up to the present time. The translations of the last two have been carefully prepared, the originals having been followed as closely as English idiom would permit.

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