SHORTER NOTICES

Introduction à l'Étude de la Mécanique Ondulatoire. By Louis de Broglie.
    Paris, Hermann, 1930. xvi+292 pp.
Recueil d'Exposés sur les Ondes et Corpuscules. By Louis de Broglie. Paris,
    Hermann, 1930. 80 pp.

In these two books the reader will find set forth in lucid form the basic
ideas of the new wave mechanics as developed by the author during the
period since his epoch-making dissertation of 1924. The German translation of
the first volume (which curiously enough appeared in 1929) has already been
thoroughly and ably reviewed in this Bulletin by Professor R. D. Carmichael
(vol. 36 (1930), p. 459) and hence further notice is unnecessary here.

The second and shorter of the two works is a collection of five rather gen-
eral, non-mathematical articles and lectures written or delivered by the author
during the years 1927–1929, all bearing to a considerable extent on the new
wave conception of matter. The first is a historical essay on the work of
Fresnel and its significance for modern physics. Written in 1927, it is peculiarly
appropriate, since that year marked the one hundredth anniversary of Fresnel's
premature death at the very time when his brilliant intellect seemed destined
to solve completely the problems of light. The essay is introduced by an ad-
mirably succinct account of the historical development of optics to the early
part of the nineteenth century followed by a recital of the way in which in the
short space of twelve years Fresnel was able to place the wave theory of light
on a firm foundation. The difficulties with the wave theory are then discussed
together with the rise of the quantum theory with its emphasis on the particle
idea. Though the physical basis of Fresnel's theory has long been seen to be
untenable, the mathematical treatment of wave motion which he and Hamilton
carried through has been of the greatest assistance in the development of the
new theory of the past decade.

The second paper, on waves and corpuscles in experimental physics, was
originally delivered as an address before the British Association at the Glasgow
meeting in 1928. In it de Broglie retraces briefly the chief features of his wave
mechanics and their experimental verification by the beautiful researches of
Davisson and Germer, G. P. Thomson, and others. This is followed by a dis-
cussion of the precise physical interpretations which have been given to the
matter wave by various workers, including Schrödinger and de Broglie himself.
An unusually clear presentation of the Bohr-Heisenberg point of view and
the uncertainty principle closes the essay.

The third paper, on the recent crisis of wave optics, is based on a lecture
delivered in 1929 before the Conservatoire des Arts et Métiers, and takes up in
conversational style the difficulties encountered in reconciling the wave and
particle conceptions in optics. The fourth likewise is a short popular article on
the interference of electron waves.

The last article, on determinism and causality in contemporary physics, is
in many respects the most interesting in the collection since it touches on the

fascinating border region between science and philosophy. Beginning with the celebrated statement of physical determinism by Laplace, the author traces the development of the causal idea in physics up to the time when the quantum mechanics began to render its previous strict interpretation doubtful. There is again a brief survey of the fundamental ideas of wave mechanics followed by a detailed description of the content of the Uncertainty Principle, leading to the viewpoint that all that the new mechanics determines from the solutions of its differential equations and their boundary conditions is the *probability* of future events. As long as one remains on the macroscopic level (large scale phenomena) this situation reduces for practical purposes to the classical causality. But on the microscopic level (small scale phenomena) the new view will, if adopted in its present form, affect profoundly the whole course of future physical theory. It is for this reason that the new conception should be widely discussed from every conceivable angle, and every attempt like that of de Broglie to present its essential ideas in simple form is extremely welcome.

R. B. LINDSAY

Funktionentheorie. By K. Knopp. Part I, fourth edition (Sammlung Göschen, vol. 668). Berlin and Leipzig, de Gruyter, 1930. 140 pp.

This is a new edition of the first of the author's two little volumes on the subject. Under the four heads Fundamental Notions, Integral Theorems, Series, and Singularities, its eleven chapters cover much of the groundwork of the theory. A surprising amount of material is compressed into its pages. Definitions are accurately given, and many brief illustrations are introduced to clarify essential ideas. About seventy theorems are proved. The proofs are stripped of excess verbiage, but there is no sacrifice of completeness or rigor. Despite the compactness of the style, or perhaps due to it, the proofs are quite readable. Because of its emphasis on the essentials of the theory, the book would be a useful companion to the regular text in the hands of the beginner.

L. R. FORD

Projektive Geometrie. By Dr. Ludwig Bieberbach. Leipzig-Berlin, Teubner, 1931. iv+190 pp. +45 fig.

This is volume 30 of Teubner's Mathematische Leitfäden and is a continuation of the author's treatise on analytic geometry which appeared in the same collection and which gives an analytic treatment of elementary projective geometry. It is not an axiomatic exposition of the subject, although the importance of axiomatic argumentation is emphasized and utilized. From the fact that Professor Bieberbach is a noted analyst it may be expected that the rigor of analytic reasoning is manifest throughout. See for example the proof on pages 53–57 that the functions $\rho x_i' = F_i(x_1, x_2, x_3)$, $(i = 1, 2, 3)$, which transform lines into lines throughout the projective plane, are linear.

One welcome feature of the little treatise is the inclusion of some interesting propositions on the geometry of the triangle as features of metric specialization.

Altogether, Professor Bieberbach's *Projective Geometry* is an excellent introduction to the subject, as an analyst conceives it, and contains many valuable features.

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