

to those generally interested in the possibilities and conduct of public development works, but more especially to distinguish the problems facing an international agency seeking to assist the development of the resources of under-developed countries. It is in this chapter that Dr. Finer gives us the full measure of his quality, and for this alone the book would be a major contribution to the literature of post-war international reconstruction. It is a sound corrective to whatever extravagance there may be in the expectations raised by the growth of public opinion vaguely favourable to the establishment of such agencies on the precedence of T.V.A.

No such model, Dr. Finer points out, can be regarded as suitable for adoption in every identical feature by other countries. T.V.A. is not transplantable without reservations and qualifications, but its characteristics help to bring out the problems and suggest alternative solutions. T.V.A., as Dr. Finer points out, was the answer to a complex of economic and social problems, which involved the relationship between a nation and one of its regions, poverty-stricken, but with resources capable of development. This lucid analysis clearly indicates the problems involved and the factors of which account has to be taken—the relation between the region and the national or world economy of which it is a part, the necessity of any country seeking international assistance first providing a comprehensive scheme of development, the financial problems, the importance of clear definition of scope of powers, the relation between development schemes and social progress, the importance of training both workers and managers. In his survey of problems of international assistance, Dr. Finer recognizes the room for "wide range of diversity", nor does his caution lead him to strike any the less confidently than Lilienthal or Huxley the note of hope.

The Tennessee Valley Authority has clearly shown the way democracy can march forward. The clear understanding of what is involved in that experiment and of the factors responsible for its success should at least assist in an apprehension in Great Britain of post-war problems of reconstruction and development, national and international, which will increase the prospects of the right measures and solutions being found and implemented. R. BRIGHTMAN.

ELLIPSOIDAL WAVES OR RELATIVITY?

Propagation Ellipsoïdale, Relativité, Quanta

Par H. Varcollier. Pp. iii+398. (Alger: Baconnier frères, 1942.) 20s.

"IT is the customary fate of new truths," said T. H. Huxley, "to begin as heresies and end as superstitions." In at least one large London college, relativity was for some time regarded as a heresy, or at best a kind of pure mathematics that had drifted out of touch with reality. Now we believe that relativity is the only theory that can explain certain experimental results. This belief is mere superstition unless we are prepared to examine alternative explanations, such as that offered by M. Varcollier.

In an earlier book, "La Relativité dégagée d'hypothèses métaphysiques" (1925), he claimed that there were several hypotheses which could explain the Michelson-Morley experiment without abandon-

ing classical ideas of space and time. He has now worked out in considerable detail the consequences of one of these hypotheses, namely, that the wave front due to a source moving in a straight line with velocity v is a prolate ellipsoid the centre and forward focus of which are respectively at the initial and instantaneous positions of the source. In other words, the wave front differs from the usual sphere of radius ct in that the diameters perpendicular to v are contracted in the ratio $\sqrt{1 - v^2/c^2} : 1$. This makes no appreciable difference to the common phenomena of optics, for both hypotheses give the same velocity in the direction of motion, and the normal velocities are in the ratio given above, which for ordinary values of v is hard to distinguish from equality.

Several chapters are devoted to the mathematical development of what we may call the "ellipsoidal theory", and many of the results differ only slightly, if at all, from the corresponding results of relativity. In particular, we find a complete analogue to the Lorentz transformation. The climax is the 'ellipsoidal' explanation of experiments which are usually cited in support of relativity. Although M. Varcollier's theory is not compatible with the relativity postulate of the *universal* constancy of the velocity of light, he obtains a constant total time for the double journey of a ray such as occurs in the Michelson-Morley experiment. He is equally successful with another negative experiment, that of Trouton and Noble. Coming to the positive experiment of Döppler-Fizeau, with a law for the composition of velocities which, to a high degree of approximation, is the same as that of relativity, M. Varcollier gets an approximately equal result. In the case of Sagnac's experiment, so embarrassing for the whole-hearted believer in the relativity of rotation, in which light travels in opposite directions round the circumference of a rotating disk, M. Varcollier obtains the well-known formula, confirmed by experiment, for the displacement of the interference fringes. This arises naturally from his idea of absolute space; he is scrupulous in pointing out that in this case the 'ellipsoidal' hypothesis is not essential, as a spherical wave front would give the same result.

So far the author has done very well; but it is surprising to find no reference to the eclipse results, the advance of the perihelion of Mercury, or the spectral shift of light from the sun. Yet it was these three pieces of evidence, or at any rate the first two of them, which were chiefly responsible for raising relativity from a heresy to an orthodox tenet.

There is a final chapter (Chapter 9) which it is not fair to criticize in detail, as it is avowedly only a sketch of possible extensions of the preceding principles. It contains, among many other things, a new theory of the motion of an electric particle, with remarks on nuclear magnetism, the proton, the neutron, and the Bohr magneton. There is also a new quantum mechanics, in which it is emissive orbits that are quantized, a breach with the accepted theory that is explicitly acknowledged. However, Planck's constant and Sommerfeld's equation reappear unchanged, and the fundamental Rydberg-Bohr spectral formula is not much changed.

Whatever may be thought of M. Varcollier's results, we can all admire the courage which sustained him, in the darkest hour of his country's history, to continue his researches and to complete them for publication in Algiers, far from the facilities of Metropolitan France.

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