

BIRKHOFF ON RELATIVITY

The Origin, Nature, and Influence of Relativity. By G. D. Birkhoff.
New York, Macmillan, 1925. ix+185 pp.

This elementary introduction to the principles underlying the theory of relativity is based on six lectures delivered at the Lowell Institute in the fall of 1923 and on eight lectures delivered nearly a year later at the Southern Branch of the University of California. In the preface the author says "The degree of general interest manifested, even in the two more technical lectures given at Los Angeles, seemed to indicate the desirability of revising, extending, and unifying this material in book form. My friend Professor Hedrick encouraged me to carry out such a project, and the book now lies before the reader as part of the Macmillan series of mathematical publications of which he is editor."

The book is characterized by its insistence upon the current trend of thought towards a deeper unification of science, by the careful analysis which is made of the way in which one abstraction in science grows out of and includes earlier abstractions, by the clarity and non-technical character of the exposition of the underlying principles of relativity, and by the "formulation of a definite theory of the structure of space and time, of matter and electricity."

The great abstractions which lie back of the theory of relativity and are presupposed in its development are expounded briefly and clearly and in a masterly way. A certain important type of relativity involved in the geometry of Euclid is set forth with precision, with a backward reference to the insistence of Pythagoras upon the fundamental importance of number in the study of natural phenomena. One passes naturally from Euclid to the type of relativity which is embodied in the Newtonian mechanics as it has actually been developed. An analysis is made of the character of the space in which Newton's first law of motion can be valid. Then comes Faraday as the foremost among those who have investigated the facts concerning electricity and magnetism. Since he was lacking in mathematical training "it required his mathematical interpreter Maxwell to give Faraday's concretely expressed 'lines of force' an exact and adequate statement." In the formulation by Maxwell of the laws of electricity and magnetism there is involved a more comprehensive doctrine of relativity of natural law than that of Euclid or that of Newton. From the relativistic elements present in the great doctrines of Euclid, Newton, and Faraday-Maxwell, the author proceeds by steps having the character of inevitableness to the special and then to the general theory of relativity. This process of step-by-step development is so set forth that one can not fail to have a vivid impression of the increasing unity of scientific thought and of the way in which one abstraction is built upon and includes those which precede it. It is not a question of discarding the old for the new but a process of developing and extending the old so that it includes the new. In this is