

modern science whose demonstrable success has conferred upon its architects the irksome glory and heavy responsibility of keeper of the arms in this bewildered and divided world. The scientist, fully as conscious of his role as the prodigal son of old, is returning in spite of himself to his father's house. In short, at the critical level, scientist and philosopher alike have much to offer one another. For if the physicist can no longer ignore philosophy, except perhaps as a highly skilled technologist, neither can the philosopher ignore science, except perhaps as a historian of some specific doctrine or system. To understand not only their own sciences but, more importantly, to understand the one universe of which those sciences are the intelligible account to date, each needs the other.

It is this mutual need, as yet only vaguely understood and not widely grasped, which seems in part to underlie the crisis in our contemporary education. For, granting the desirability of meeting the need, the question naturally arises how it can be met. The average individual does not live long enough, given the organization and ill-defined aims of contemporary education, to become "informed", to say nothing of "formed", in both science and philosophy. At present, specific training in either field employs techniques and methods which beget specifically different dispositions of thought and hardly transferable insights. In consequence some scientists, in response to the needs of their own advancing science, have tended to philosophize without benefit of a sufficient formation in philosophy, and some philosophers have attempted to interpret science without sufficient understanding of its inner character. Instead of integration this situation has produced disintegration, with the dismal result that those who have achieved the greatest control over nature appear to understand the least of nature in itself. History appears to have summoned the scientist from the splendid isolation and genteel association of the laboratory and the scientific community into the seething forum of human events of which physical science in operation is but a small, though brilliant, facet. If matter yields its secrets in part through atomization and quantization, man does not. The comfortable illusion that nature can be explained in uniquely scientific terms has been exploded by science itself.

I think we may conclude then with the suggestion that the nature of science and the objectives of the scientist may not be grasped outside of a philosophical perspective to which science itself leads. To elaborate these objectives requires something more than a knowledge of physical science—a something more which our educational program as presently constituted does not provide.

References

- ¹ P. W. Bridgman, *The Nature of Physical Theory*, p. 59. Princeton University Press, 1936.
- ² A. Einstein and L. Infeld, *The Evolution of Physics*, p. 33. Simon & Schuster, 1938.
- ³ P. W. Bridgman, *Op. Cit.*, p. 65.
- ⁴ *Ibid.*, p. 67.
- ⁵ Sir Arthur Eddington, *The Philosophy of Physical Science*, pp. 6-7. Cambridge University Press, 1939.

Books

Tensor Analysis for Physicists. By J. A. Schouten. 276 pp. Oxford University Press, New York, 1951. \$6.00.

Rarely does a reviewer have the privilege of finding himself at complete loss for adequate words of praise; such is indeed the case with Professor Schouten's work. It is the conception of the master craftsman, the incisive execution of a massive form yet fluid and graceful in the sure coherence of its underlying structure and detail: a work of art!

In the brief space allowed, one can only hope to suggest the principal theme: the invariant (qua group) theoretic development of the theory of geometric objects, "affinors". To this extent, therefore, the title, presumably dictated by customary usage, does not give a true impression of either the book's fundamental scope or its intrinsic difficulty for those whose acquaintance with tensor analysis is usually conditioned by the study of relativity.

Part I of this volume follows in full and exhaustive manner the logical development of (parentheses are mine): 1. Spaces Defined by Linear Groups (the affine group G_a and its subgroups); 2. Geometric Objects in E_n (an affine space, the manifold of all linear transformations); 3. Illustrations of Quantities in E_n After Introducing a Subgroup of G_a ; 4. Geometric Objects in X_n (the manifold of all invertible analytic transformations); 5. Geometry of Manifolds Which Have a Given Displacement. This is followed by a concise summary of these five chapters, and special mention should be made of Professor Schouten's positive gift for visualization and diagrammatic presentation of geometric entities which are elsewhere usually left in abstracto.

Part II develops applications according to: 6. Physical Objects and Their Dimensions; 7. Applications to the Theory of Elasticity; 8. Classical Dynamics; 9. Relativity; 10. Dirac's Matrix Calculus. In each chapter, though necessarily brief, the reader cannot fail but be impressed by the sureness of treatment and the repeated selection and illumination of the "essentials". Finally, it is for many reasons interesting to see Dirac's methods so fully appreciated and evaluated within a broader framework by one of the finest mathematical minds of our times.

It is a privilege to unqualifiedly recommend this distinguished work, nor can I omit mention of the elegant reproduction which again marks an Oxford volume.

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