# TURNING POINTS IN PHYSICS

**Turning Points in Physics**

A Series of Lectures given at Oxford University in Trinity Term 1958. By R. J. Blin-Stoyle, D. ter Haar, K. Mendelssohn, G. Temple, F. Waismann and D. H. Wilkinson. (Series in Physics.) Pp. v + 192. (Amsterdam : North-Holland Publishing Company ; New York : Interscience Publishers, Inc., 1959.) 20*s*.

DURING Trinity Term, 1958, a series of lectures was organized by the Reader in the Philosophy of Science and the Lecturer in the History of Science in the University of Oxford. The lectures, collected in this volume, are: (1) "The End of Mechanistic Philosophy and the Rise of Field Physics", by Dr. R. J. Blin-Stoyle ; (2) "The Quantum Nature of Matter and Radiation", by Dr. D. ter Haar ; (3) "Probability enters Physics", by Dr. K. Mendelssohn ; (4) "From the Relative to the Absolute", by Prof. G. Temple ; (5) "The Decline and Fall of Causality", by F. Waismann, and (6) "Towards New Concepts : Elementary Particles", by Prof. D. H. Wilkinson. The audience to whom they were originally addressed was composed of philosophers and scientists who were not physicists. The publishers suggest that they can be understood by laymen ; I have the word of an historian colleague, who recommended the book with great enthusiasm for the general library, that this is so. He had some reservations, it is true, about grasping all the points raised ; and it is not exactly light reading, even for the scientist. As an account of the origins and development of the present state of theoretical physics it is most stimulating ; and to be able to communicate so much of the physicist's outlook at a non-specialist level is a magnificent achievement.

The title "Turning Points" is itself significant. Thirty or forty years ago classical physics was spoken of in rather dismal terms of 'downfall' ; by inference, the supplanting modern physics was undergoing uplift—and it apparently did, quite out of this world. But the outcome of all this has not been depression or exaltation ; nothing less than a complete reorientation of all our ideas has been necessary, and this turning has not really been a sudden event. As the first lecture points out, the fulcrum was effectively set up by Faraday ; and the statistical approach goes back nearly as far—but applied only to classical particles. The quotation from Niels Bohr—"My method is to try to say what I cannot say, because I do not understand it" ; Dr. Waismann's statement that quantum physics presents a strong case against traditional logic ; and Prof. Wilkinson's remark that the first stumbling block for people who want to understand the elementary particles is that some of the things they learn run counter to common sense, between them emphasize the kind of turning that is demanded. In the macroscopic world of everyday life, we can 'understand', use classical ideas, relate matters as 'cause and effect', work to the rules of logic, and be guided by common sense. In the microscopic world of atomic physics, none of these things can happen. The physicist has to live a life of double-dealing between two worlds—observing with macroscopic apparatus, and interpreting in terms of microscopic concepts which have no counterparts in ordinary life, either in essence or in behaviour. Each of the lectures shows clearly the terms of reference within which modern physics operates.

Rule out causality, mechanical particles, identifiable individual particles, and the appeal to analogy taken from everyday life, and what is left of the microscopic world except concepts that can only be handled as mathematical abstractions ? This question, which is the real difficulty facing the ordinary reader (and most of us older physicists as well), is squarely met in the contributions of Prof. Wilkinson and Prof. Temple. The answer is, general invariance or symmetry or conservation conditions, and 'properties' (if that is the term) to which such conditions can apply—such as Newton's third law of motion (Temple) or the conservation of isotopic spin (Wilkinson), which seem indeed to have much in common.

Illustrations and examples strike a fresh and original note. The derivation of the Lorentz transformation (Temple) is neater and simpler than that in the text-books. The conflict between causality and the uncertainty principle (Waismann) is illustrated by idealized experiments, and numerous examples of the application of the principle are given. The account of the elementary particles (Wilkinson) is both up to date in content and superb in its clarity ; the author does not, of course, lament that physicists are large compared with $m_e$, and long-lived by $K$-meson standards—but he mentions that this immense difference in scale prevents us from even being able to describe the microscopic world in ordinary language at all. The lighter touches and personal reminiscences that drop into place here and there suggest that the authors were thoroughly enjoying their task ; they must have done, to be able to accomplish it so brilliantly. G. R. Noakes

# CATALYTIC PROCESSES AND PETROLEUM

**Catalysis**

Edited by Prof. Paul H. Emmett. Vol. 6 : Alkylation, Isomerization, Polymerization, Cracking and Hydroreforming. Pp. vi + 706. (New York : Reinhold Publishing Corporation ; London : Chapman and Hall, Ltd., 1958.) 156*s*. net.

THIS volume is the penultimate one in this very comprehensive series ; it deals with the catalytic processes that have now such an important place in the petroleum industry. The editor is to be congratulated on this further stage of his monumental task and in particular on achieving a very reasonable uniformity of treatment in the six 'chapters' written by eleven authors. Each chapter forms a clearly defined section dealing with an important refinery operation involving catalysis and comprising alkylation (with 59 references), isomerization (322 references), polymerization of olefines (212 references), catalytic cracking (126 references) and reforming (164 references), together with a chapter on the mechanism of polymer formation and decomposition (374 references). The large number of references makes the volume a valuable starting point for further study, particularly to chemists entering the petroleum and petrochemicals field. At the same time the authors have accepted the responsibility of surveying this mass of literature and presenting it as a coherent account and not simply as a collection of abstracts.

Earlier volumes in this series dealt, of course, with the fundamentals of catalysis, so that the authors here are free to deal with the more specialized and prac-