

Book Reviews

ORDERED ELEMENTS

The Periodic System of Chemical Elements

A History of the First Hundred Years. By J. W. van Spronsen. Pp. xv + 368. (Elsevier: Amsterdam, London and New York, 1969.) 120s.

THE importance of the periodic system in modern thought has never been adequately estimated or expounded. More than any other interpretation of physical nature except Newton's, it made clear the orderliness and potential comprehensibility of the material world. One reason why nobody has yet written an appreciation of its effect on the rest of science, let alone on modern philosophy, religion or literature, is that its history has been taken too much for granted. Chapters on it included in general histories of chemistry have usually repeated a few names and a few incidents, but have, by and large, neglected critical appraisal of its deeper consequences.

Now, van Spronsen has made an important and substantial contribution to the history of chemistry. The "Hundred Years" of his title is not to be taken literally: after a survey of the relevant features of the earlier history of chemistry, he begins his detailed study with the precursors of the modern classification system (for example, Döbereiner 1817) and goes on eventually to discuss the significance to classification of the quantum theory and the trans-uranium elements, covering more than a century and a half. In the period from Döbereiner's second essay (the triads of 1827) until MendeléeV's own second main paper of 1871, van Spronsen excels all previous writers on this subject in the completeness of his account. He shows how the MendeléeV system was the culmination of an irregular development, confidence among chemists that there was a system to be elucidated growing stronger decade by decade after 1827.

He draws attention to many important chemists whose work on classification has been forgotten, Dumas in particular. It is striking to see how the search for a grand design was frustrated again and again, paradoxically by a concentration on quantitative factors. As atomic weight determinations grew more precise and reliable, the arithmetic of the relation between their numerical values was pursued with such energy as to obscure the significance of mere sequence. One reason for this is that molecular weight determinations were also becoming more precise, so that the homologous series of organic compounds presented a very persuasive, but misleading, model for a theory of atomic weight relations. One incident in the long history of scientists failing to communicate is the proposal by Beguyer de Chancourtois of a helical distribution of atomic weights. He showed a periodicity but did so without clarity or force. He was well on the right track but his ideas were not published diagrammatically in a clear enough way. Van Spronsen does him justice as he does also to a virtually forgotten chemist, the Dane Hinrichs, who emigrated to become a good American and a good teacher. Hinrichs' flat spiral shows enough periodicity to be worth more than a mention.

The better known men, Odling, Newlands and Lothar Meyer, are fully dealt with, but this does not diminish the standing of MendeléeV. He sought a means of putting order into his teaching and in doing so produced

not only a new foundation for the whole of chemical teaching, but also a unified theory and a stimulus to research, a very great achievement.

Van Spronsen examines the various predictions of new elements, the gradual solution of problems like the deviation from weight order, the assimilation to the system of the noble gases, and the inevitable debates on priority. He brings the story up to the point where it can be seen to be continuous with recent progress in physics and chemistry. Every section is well illustrated with original or adapted diagrams and tables.

This book can hardly fail to have a beneficial effect on the study not only of the periodic system but of chemistry as a whole. Perhaps it may even encourage somebody to attempt a general appreciation of the place of the periodic system in modern thought. FRANK GREENAWAY

PHENOMENOLOGICAL CLASSIC

Formal and Transcendental Logic

By Edmund Husserl. Translated by Dorion Cairns. Pp. xix + 340. (Nijhoff: The Hague, August 1969.) 30.60 guilders.

EDMUND HUSSERL began his life as a mathematician, but as a philosopher he moved steadily away from rigorous deductive procedures into a preoccupation with problems of the psychology of perception. Thus his intellectual development diverged widely from that of Bertrand Russell, and this divergence expressed the great cleavage which has developed during this century between continental European schools of philosophy and those of the English-speaking world. The same cleavage is reflected in the fact that 40 years elapsed between the original publication of this major work of a leading European philosopher and its first English translation, a labour of devotion by Professor Cairns.

Formal and Transcendental Logic is a very abstract and technical work which uses a somewhat esoteric vocabulary. Serious philosophers with an interest in phenomenology will welcome it and study it, but it is hardly a work which will be suited to the needs of the average scientist in search of a philosophical basis for his thinking. Husserl himself was interested in science, and he hoped that his phenomenology would provide a better basis for scientific thinking than other modern philosophies could. Oddly enough, the author of *Cartesian Meditations* tends to turn to Euclidean geometry when he wants an example of scientific method.

Formal logic is the kind that is classically formulated in Aristotle's *Analytics*, and the first part of Husserl's book is devoted to an examination of its nature and limitations, when looked at from the point of view of the psychology of perception. "Transcendental", in Husserl as in Kant and Hegel, means concerned with the intrinsic nature of existing things, rather than with mere perceptions or concepts; the Hegelian dialectic was proposed as a procedure of transcendental logic, though Husserl does not deal with it in this book. The latter half of it is an attempt to explain how transcendental logic differs from and transcends the formal variety, without invalidating or negating it. The book does not include, nor did Husserl ever formulate, a direct exposition of the principles of transcendental logic on the lines of the *Analytics*.

For scientists, without the philosophical training required by a reader of this book, there are two currently available works which provide in more readily understood form critiques of formal logic basically similar to that of Husserl and which both look forward to something like the transcendental logic which he advocated; they are Michael Polanyi's *Personal Knowledge* and Stephen Toulmin's *The Uses of Argument*. Those who have read and understood works like these might be ready to begin the study of Husserl's philosophy. R. A. CROWSON