

book reviews

Intuitive science

Thematic Origins of Scientific Thought: Kepler to Einstein. By Gerald Holton. Pp. 495. (Harvard University: Cambridge, September 1973.) \$10 cloth; \$3.95 paper.

THE fifteen papers in this collection, all published previously in a variety of books and journals over the last twenty years, are printed here largely in their original form, but with the addition of a short general introduction to explain why they are all brought together into one volume. Each deals in some way with what Professor Holton terms the "themata" of science, that is the "unverifiable, unfalsifiable, and yet not-quite-arbitrary hypotheses" which are based not on empirical experiment and observation, nor on logical deduction, but simply on our general intuitions and beliefs about how we expect nature to behave.

The first three essays attempt to explain the concept of themata at length; the second essay concentrates on the metaphysical ideas underlying Kepler's description of planetary motions, and uses these as an illustration of how such ideas—in Kepler's work the belief that the Sun must be the centre of the Universe, and the belief in the underlying mathematical harmony of nature—form an essential part of the processes of scientific discovery. This is the only essay in which Professor Holton makes a lengthy excursion into early science; elsewhere his examples are drawn mainly from modern physics.

The second section, which comprises well over a third of the book, is devoted to relativity theory. The papers here, still very much concerned with the general question of underlying themata, cover the field of Professor Holton's most thorough historical research, and reflect his extensive study of the material in the Einstein Archive at Princeton Institute for Advanced Study. In particular the ninth essay shows, by extensive reference to source material, that Einstein received the inspiration for his relativity theory not so much from the famous Michelson-Morley interferometer experiments (as tradition would have it) as from the thematic influences from his contemporaries and from his own view of nature.

The next three essays are devoted to a discussion of how the themata of science (here referred to as the "non-rational substructure") are becoming

increasingly less acceptable as a facet of formal science. A distinction is drawn between "private science" and "public science"—the former the unrecorded progress of the individual towards a new theory, and the latter its presentation to the outside world, stripped of all description of the initial gropings of its author and set down tidily and rationally. The remaining two essays in the book deal with the role of science in education; Professor Holton asserts here that it is both essential and possible to give the man in the street, or at least the schoolboy at his desk, an adequate awareness of the present state of science, an awareness necessary to the health of our technologically based society. We must not only look outside science for some of the themata which govern scientific discovery, but must also allow science itself to operate in a reciprocal fashion upon our other fields of understanding. To achieve this, there must be a radical redesign of school and college curricula.

All the essays are fascinating and thought provoking (in his introduction Professor Holton writes "a chief aim of these essays is to raise new questions for research rather than merely to answer old ones"), and they are written for the most part in a language accessible to scientist and historian alike, despite the fact that many of the topics treated are by no means easy to present briefly and clearly to the uninformed reader. But there is some clumsiness in his exposition of the meaning of the term "themata" both in the introduction and in the first essay; his use of a three dimensional "space", with x , y and z directions representing respectively the empirical, logical and thematic components of scientific propositions seems to me both unnecessary and confusing. The concept of themata is not so complicated as to warrant such a laboured model for its explanation.

There are two difficulties inherent in an unedited collection of papers of this sort. First, there is inevitable overlapping between the papers, and here this is particularly so in the section on relativity theory; it is tempting to wish that the papers had been integrated into one coherent whole. Second, although the title of the book implies a common thread which runs through all the papers, many of them were not written with the primary or single purpose of describing the "thematic origins of scientific thought". Thus the twelfth

essay, *Models for Understanding the Growth of Research*, is more a study of the rapid increase in scientific information and investigation in recent decades and its general causes than a specific study of underlying themata currently guiding research.

The study of themata is by no means new in the history and philosophy of science (although this name for them is a little unfamiliar); and many of these papers were written so long ago that they have lost some of their original freshness—the author readily admits this. But for the scientist coming newly to the history of his subject, or for the layman seeking some insight into the nature of research, this collection of papers should prove enlightening, and convince him of the essential humanity of science.

Laura Tilling

Disease distribution

Epidemiology of Neurologic and Sense Organ Disorders. By Leonard T. Kurland, John F. Kurtzke, and Irving D. Goldberg. Pp. xxx+436. (Harvard University: Cambridge; Oxford University: London, September 1973.) £7.

THIS monograph is one of a series of reviews of the epidemiology of various conditions published by the American Public Health Association. The series fills a long-standing need for material of this type. This particular book reviews morbidity and mortality data—a number of the others have confined themselves to the latter. The title, "Neurologic and Sense Organ Disorders", is slightly misleading because there is no reference to cerebrovascular accidents, cerebral tumours or cerebral infectious conditions. The volume is otherwise comprehensive.

The first chapter contains an introduction to epidemiology. This is inappropriate: it is too short to do justice to the subject and does not describe it well. Further chapters are devoted to convulsive disorders, Parkinsonism, multiple sclerosis, amyotrophic lateral sclerosis and other motor neurone disorders, muscular dystrophy and other myopathies, myasthenia gravis, Down's syndrome, congenital malformations of the nervous system and other specific neurological disorders, cerebral palsy, blindness and hearing disorders.

The first seven chapters, particularly those concerned with multiple sclerosis, amyotrophic lateral sclerosis and mus-