

the lucidity of the text is excellent. The volume is liberally referenced, and includes a table listing the principal notation as well as an author and subject index. It is a very worthwhile addition to the literature on atmospheric optics.

A. H. JARRETT

HOYLE'S UNIVERSE

Galaxies, Nuclei and Quasars

By Fred Hoyle. Pp. vii+160. (London: Heinemann Educational Books, Ltd., 1966.) 25s. net.

FRED HOYLE can always be relied on to be interesting. This book is a free-wheeling discussion of implications of the observations on galaxies, radio sources, quasars and associated topics, cosmological theory, the origin of the nuclear composition of matter, and certainly also of Hoyle's opinions on all these matters. They are weighty opinions, even though the final discussion may read differently.

The book is a display of virtuosity in the field. Many considerations are put forward, many quantities evaluated, many consequences pursued, much knowledge displayed, and the result is a demonstration of the procedure that should be followed in an uncertain, speculative, developing subject. One should not admonish Hoyle for giving his opinions, not always soundly based, in such authoritative form; rather one should admonish the other workers in the field for not presenting the equally tenable alternatives with similar power to give the world a more balanced view. No attempt is made to give the origin of much of the material presented, and the reader will be left unaware of the particular lines of advance that are Hoyle's own.

The lectures presented in the book are perhaps addressed to an audience that does not exist—a high degree of sophistication is needed to follow the arguments, but very little factual knowledge is assumed in astronomy or the other physical sciences. Are there any readers who can follow the difficult arguments when they have only just adsorbed the basic facts? Perhaps there is a breed of highly intelligent ignoramus. Perhaps there are people of superior intellect in the "other culture" who will use this book to cross the line. Most likely the many physical scientists who will read it will ignore the material they do not need, and gloss over the few passages they cannot understand. They will still find the book well worth reading. It will convey to them the thrill of a subject that is fundamental, rapidly developing, full of ideas—the thrill of intellectual history being made—the thrill that is science.

T. GOLD

SEDIMENTS AND CYCLES

Symposium on Cyclic Sedimentation

Vol. 1: Pp. viii+1-380. Vol. 2: Pp. 381-636. Edited by Daniel F. Merriam. (Kansas Geological Survey Bulletin 169.) (Lawrence, Kansas: State Geological Survey of Kansas, University of Kansas, 1964.) \$7.

GEOLOGISTS have long been aware that the different lithologies of many parts of the sedimentary geological record are arranged vertically in an orderly manner, which is evidence for an orderly repetition of sedimentary environments in time at a place. The resultants of such repetitions include annual or seasonal varves, cyclothem several tens of feet thick that required a few tens of millennia for their production, and whole formations arranged in definite patterns on a much grander scale of thickness and time. Though the present symposium is an official publication of the State Geological Survey of Kansas, and the contributors of the thirty-eight papers that make up the volumes come entirely from institutions

in North America, the range of topics treated is commendably wide.

It is perhaps appropriate that half the papers should relate to Upper Palaeozoic cyclothem in the Mid-Continent region of North America. Many of the authors concerned with this problem, including Bissell, Imbrie, Laporte, Merriam and Wagner, focus attention on the environmental significance of cyclical limestone deposits. The palaeoecology of these is assessed by Elias, Harbough, McCrone and Moore. The paper by Moore, the longest of the contributions, will be especially useful to workers outside North America on account of its faunal-floral lists and assembled illustrations.

Two of the case history papers not concerned with Mid-Continent cyclothem are outstanding. Van Houten gives a detailed and incisive analysis of Upper Triassic lacustrine cyclothem—some detrital and others chemical—in the New Jersey-Pennsylvania Triassic basin. Fischer has investigated the Late Triassic Dachstein cyclothem made famous by Bruno Sander. According to Fischer, the cyclothem accumulated in the intertidal and subtidal zones of a large lagoon.

Berbowler has contributed the only paper on cyclothem originating in alluvial environments. This, however, is fundamental. It contains a theoretical treatment, but presents a model of alluvial cyclothem that can certainly be matched in rocks of various ages in Europe and North America. It should promote much new research.

Anderson makes a useful attack on a neglected but important geological problem in a paper on the varve calibration of stratification. He is concerned with the frequencies with which different sedimentary events occur in sedimentary environments and the frequencies of preservation of those events in terms of rocks and relationships between rocks.

It is perhaps invidious to have singled out particular papers from a collection nearly all of which reaches a high standard of interest and usefulness. But, for these papers alone, the *Symposium on Cyclic Sedimentation* is well worth its very modest cost. Dr. Merriam and his sponsors and collaborators deserve warm praise for creating an important scientific event.

J. R. L. ALLEN

INSTANT FACTS

Chronology of the Modern World

1763 to the present time. By Neville Williams. Pp. xiii+923. (London: Barrie and Rockliff, 1966.) 60s. net.

ACCORDING to one version, Pandora's box contained all the blessings of the gods, which, on its opening, escaped and were lost, with the exception of hope, which was at the bottom. If this is true, then the claim by the publishers of Dr. Neville Williams's *Chronology of the Modern World* that it is a "veritable Pandora's box" is not very apt: the book is more likely to prove a constant source of reference tokens and a useful mini-encyclopaedia. Significant information of the past two centuries is chronicled year by year in monthly paragraphs and also under classified headings. The *Chronology* is a mine of political facts and also of events and achievements in science, philosophy, the arts, the press, entertainment, statistics, and births and deaths. That Pierre Michaux manufactured bicycles in 1867, that on February 2, 1916, Ray Lankester led the Committee on the Neglect of Science in its campaign for greater awareness of science in British schools, universities and civil service, and that the omega-minus particle was discovered in 1964 at Brookhaven using the *Nimrod* cyclotron, are the kind of scientific facts which are there for the gleaming. A feature which makes this work a valuable reference source is its index: that this occupies 210 pages and contains about 30,000 entries gives some idea of the coverage offered. Certainly, there are lacunae,