of Kapteyn's method to even greater distances. Here we find a careful résumé of Shapley's analysis of globular clusters which forms the basis of present-day views of the galactic structure. The extraordinary size of our own galactic system, as compared with distant spiral nebulae, is still a matter of great concern in modern astronomy. Sad experience has trained the scientist to be wary of introducing the term "exceptional" in his conceptions of the universe.

The closing chapter of "Kosmos" deals with "Relativity and Modern Theories" and gives an excellent summary of the contributions of Einstein and of the author with regard to the more theoretical aspects of the properties and distribution of matter and space. In conclusion, Dr. de Sitter remarks:

> Our conception of the structure of the universe bears all the marks of a transitory structure. It is not possible to predict how long our present views and interpretations will remain unaltered and how soon they will have to be replaced by perhaps very different ones, based on new observational data and new critical insight in their connection with other data. . . . By the use of mathematics, that most nearly perfect and most immaterial tool of the human mind, we try to transcend as much as possible the limitations imposed by our finiteness and materiality, and to penetrate ever nearer to the understanding of the mysterious unity of the Kosmos.

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Electric Clocks. By F. HOPE-JONES. xv + 259 pp.; 127 figs. London: N. A. G. Press, 1931. 12s. 6d.

EVER since the discovery of electromagnetism, nearly one hundred years ago, men have sought to find some way of time measurement. The author in this volume has made an exhaustive study of the evolution and development of devices which have been proposed for the improved measurement of time.

He has grouped his discussion about three heads, namely: (1) Independent self-contained clocks whose motive power is electrical; (2) synchronizing systems in which a signal is transmitted at regular intervals to correct the hands of independent clocks of all kinds; (3) electrical impulse dials, in which a master clock transmits impulses at minute, or half minute intervals, to propel the hands.

His descriptions are generally clear, but suffer in places by being too brief, or otherwise inadequate to convey the idea which he is trying to impart. Many of the figures also are too crude or too carelessly drawn to be readily understood by one who has not seen the mechanism. From a perusal of the work, one idea above all others emerges, namely, the astounding accuracy of the free pendulum and slave clock, to which the author contributed the remontoir, and W. H. Short the impulse mechanism, and the method of synchronizing the slave with the free pendulum. The performance of the Short clock has equalled if not exceeded the accuracy of the transit observations themselves.

It seems as though the author ought to have mentioned the application of the quartz-crystal controlled oscillator to time measurements. At the last reports on the performance of this device, it showed a constancy of one part in ten million over a period of some days.

The author mentions the Telechron system, by which a wheel work is actuated by a synchronous motor, operated on city service A. C. circuits, which are held to a constant frequency, but does not seem to know of the very extensive vogue which the system has attained in the United States. The convenience of obtaining a clock which requires no attention, and is accurate to four or five seconds, by merely plugging in on a house lighting circuit, seems likely to displace all other clocks for civil purposes. This, combined with the frequent distribution of time signals by radio, has changed the attitude of the whole world towards clocks.

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An Introduction to the Literature of Vertebrate Zoology. (Based Chiefly on the Titles in the Blacker Library of Zoology, the Emma Shearer Wood Library of Ornithology, the Bibliotheca Osleriana and Other Libraries of McGill University). By CASEY A. WOOD, xix, 643 pages, colored frontispiece. Oxford University Press, 1931. Price, 3 guineas.

IN the preparation of this work, Dr. Wood has rendered an important service to students of vertebrate zoology, who have been greatly in need of a systematic and comprehensive treatment of the literature of their field. An undertaking of this magnitude inevitably presents features for blame as well as for praise. As a bibliography of a large division of the field of zoology, it leaves much to be desired. It suffers from the limitation of having been compiled in the libraries of a single university. The entries vary in completeness from full citations to fragments, such as "Zooiasis. 1834–6? Leipzig." The treatment of periodical literature is extremely inadequate. Pamphlets are in many cases referred to simply as "author's reprints," with no indication of the original place of publication. But on the other hand the work possesses outstanding merits more than sufficient to compensate for its shortcomings Where else can one