

ordinates fixing its orientation in the universe in 24 hours, whereas in 24 hours its translational motion has changed its relative position in the universe by something of the order of 10^{-12} , taking the diameter of the stellar universe as 300,000 light years.

It appears very natural therefore to expect that any translational effects are so small compared with any rotational effects that they are far beyond the reach of present observation, but in principle we recognize that such effects may well exist, and therefore the special principle of relativity may very probably be only a close approximation.

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CONCERNING EXCEPTIONAL HAILSTONES

THE note in a recent number of this Journal (58: 443, 30 Nov. 1923) describing peculiar hail observed by Professor Bevan recalls that I made very similar observations some years ago during a hailstorm on the coast of California at Carmel. The conditions permitted a fairly close study of the structure of the hailstones which fell, and I was able to make a number of sketches showing their form, size and structure. An account of my observations was published in the transactions of the Royal Society of Canada, Vol. X., Series III, pages 47-50, 1916.

It seems probable that the meteorological conditions along the Pacific coast are not infrequently such as to produce the particular kind of hail described by Professor Bevan and by myself.

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SCIENTIFIC BOOKS

DEAN'S BIBLIOGRAPHY OF FISHES¹

THE monumental "Bibliography of Fishes," begun by Professor Bashford Dean in 1890, and continued with help of Charles R. Eastman, Eugene W. Gudger, Arthur W. Henn and many others, has been brought to completion by the issue of the third volume. To call this work monumental is only the beginning of defining adjectives. It is majestic, commanding, and, above all, insistently useful. No one in the future can attempt research in ichthyology without having these volumes at his elbow. The sciences which rest on observation, the study of structure, habits, distri-

¹"A Bibliography of Fishes." By Bashford Dean. Enlarged and edited by Charles R. Eastman. Vol. I (A. to K.); Vol II (L. to Z.).

"A Bibliography of Fishes." By Bashford Dean. Extended and Edited by Eugene Willis Gudger, with the cooperation of Arthur Wilbur Henn. Vol. III (Indices, etc.). American Museum of Natural History, New York.

bution, classification and evolution of living organisms, have gone so far and through so many hands that they are likely to be swamped in the thickets by themselves created. A system of clearing-house is vitally necessary. This is true in every field of natural history, not least in the fishes, the monstrous, ancient and varied group from which all the higher classes of vertebrates are offshoots.

In brief, Dean and his associates have tried to furnish a clue to everything of any permanence which has been written about fishes. They have listed every book or paper which has added to knowledge, and some which unwittingly have turned science backward. In the first two volumes the authors catalogue, with occasional comments, about 35,000 titles of books and memoirs since 1758, the date of the tenth volume of Linnæus's "Systema Naturae," with which scientific classification of animals began. The third volume, now before us, contains everything that the worker could desire which the other volumes omit. The title page asserts that it includes "indices, general bibliographies, periodicals relating to fishes, early works, voyages and expeditions, addenda and errata of Vol. I and II."

This modest enumeration will bear analysis. We find first a list of anonymous papers of varying importance, but worthy of record. These relate largely to fishing interests. Next comes, as "Addenda," papers overlooked in the first and second volumes. For never yet was a voluminous record absolutely complete. This fact was noted by Aristotle, who is quoted as saying (in substance): "It is pedantry to expect a degree of accuracy which the subject does not permit." Next follow titles of publications before Linnæus, though these are not considered in modern taxonomy, for a system of naming must have its beginning somewhere, yet knowledge owes much to some of these early authors. Clear minds and keen eyes came into civilization long before the printing press or the steam engine made diffusion of opinion easy. Among these ancient worthies we may name Aristotle, of course; Ælian, inventor of fly-fishing; Aldrovandi; Ausonius, who sang the trout and grayling of the Moselle; Artedi, who taught Linnæus most that he knew of fishes; Gesner; Gronovius; Ray, Rondelet and Willughby. Among these stands Izaak Walton, in a class by himself. Next follows a long list of early anonymous writers, and a record of bibliographies, large or small, the work of preceding compilers. The fifth chapter records voyages and expeditions in which fishes and fish information have been secured. Among these, our own "Albatross" holds an honorable place. Next comes the long list of periodicals devoted to fish culture. Then follow the errata and corrigenda of the first two volumes, these largely relating to initials of foreign writers and to duplications in reprints.