Ocean. The first specimen, 18 feet in length, came ashore on Ormond Beach in 1902. The second, a 38-foot specimen, was taken by Captain Charles Thompson of Miami and Mr. Charles T. Brooks of Cleveland, Ohio, in May, 1912. The third (31 feet long) was captured by Dr. H. Schlegel and others in the Bay of Florida, June 10, 1919, and the fourth (31.5 feet between perpendiculars) is the present specimen. The fifth record for the Atlantic is the specimen (about 30 feet long) rammed by the steamship *American Legion* in May, 1922, near the Abrolhos Light off the coast of Brazil, and noted by me in SCIENCE, 1922, Vol. 66, pp. 251–252, and in *Natural History*, 1923, Vol. 23, pp. 62–63.

E. W. GUDGER
AMERICAN MUSEUM OF NATURAL HISTORY

## QUOTATIONS

### MEDICAL RESEARCH

SIR,—In your issue of the 7th a patient points out in a very vivid letter the benefits, dangers and costliness of insulin in his own case of diabetes. He shows clearly that it is impossible to continue its use indefinitely, and when discontinued that the diabetes returns with death as the unavoidable result. This demonstrates conclusively the need for one thing—the discovery of the real cause of diabetes, and this can only be attained by experimental research.

The key to the discovery of insulin was Minkowski's demonstration in 1905 that every dog from which the pancreas (the sweetbread of our dinner table) was removed died of diabetes. Evidently there was something in the pancreas which prevented the disease. Banting and Best discovered that something. But that discovery still leaves us in the dark as to what is the disturbance of nutrition—the metabolism of the body—which prevents the burning up of the sugar in the blood. This accumulation of sugar inevitably causes death, slowly in most adults, swiftly in children.

It is perfectly evident to any open-minded person that the discovery of the cause of this disturbance of the nutrition in the body cannot be made simply by clinical observation on man. It can only be obtained by experimental research on animals. This is a duty imposed upon our research workers. Any obstacle put in their way is deliberate cruelty to human beings, and not to a small number of human beings, but to a very large number, especially of children.

When the alternative of experimenting on animals or of allowing multitudes of human beings to die of diabetes is presented to any unprejudiced mind, there can be but one answer. The lives of human beings are of infinitely more value than those of animals. Moreover, once the cause is discovered, the lives and happiness of human beings and their families are conserved for all future time. The sacrifice of a relatively few dogs sinks into insignificance in comparison with the lives and happiness of multitudes of human beings.—*W. W. Keen, in the London Times.*

## SCIENTIFIC BOOKS

*A classification of fishes including families and genera so far as known.* By DAVID STARR JORDAN, Chancellor Emeritus of Stanford University. Stanford Univ. Publ. (Biol. Sci.), Vol. 3, No. 2, 1923, pp. 79–243, i-x.

UNTIL the appearance of the work cited, ichthyologists had long waited for a comprehensive classification of all the known genera and families of fishes. Not since the publication of Günther's *"Catalogue of the fishes of the British Museum* (1859 to 1870)" had any one attempted to supply this need. The work of Günther had been a long and tedious one, having required for its completion a considerable part of the lifetime of one of the most laborious of systematic zoologists. Furthermore, the knowledge of ichthyology had since that time been greatly widened in many ways.

The task of preparing a new classification year by year had thus become increasingly large and difficult: so much so, in fact, that Dr. Jordan alone among living workers possessed a knowledge of the literature of ichthyology which was sufficiently comprehensive and an acquaintance with the fishes of the whole world intimate enough to permit of the preparation of such a work.

In this latest classification, fishes, living and extinct, are arranged under six classes: Leptocardii, Marsipobranchii, Ostracophori, Arthrodira, Elasmobranchii and Pisces. The "true fishes" are further divided into three subclasses: Crossopterygii, Dipneusta (Dipnoi) and Actinopteri. The Actinopteri are made to include the superorders Ganoidei, Teleostei and Acanthopterygii (the author, however, certainly did not intend to remove the group last named from nor to coordinate it with the Teleostei). The teleost fishes are divided into no fewer than 39 orders, the increase being largely accomplished by the elevation of various groups, largely the serranoid derivatives, from subordinal to ordinal rank.

Space will not permit of the discussion, or even an outline, of the limits and positions assigned to these various groups. As a whole Dr. Jordan has followed recent suggestions regarding the status of the major groups of fishes.

There is widely used throughout the work, particularly among the "higher" fishes, a group termed the *series.* Usually but not consistently the names of series are formed by adding the suffix *-iformes* to the root of the typical genus of the group. In most cases the series are used as strictly or approximately coordinate with suborders, but once a series (Ostariophysi) is used to include several orders, while in a few instances series are subordinated to suborders.

The most striking taxonomic feature of the whole work—one which will appeal to many systematists as radical—is the extreme multiplication of family divisions. In all, the fishes are divided into 638 families; the teleosts alone are split into 511; the current group Cottidae, to take an example, is analyzed into 12 families. The increase in the number of families has been brought about by the entire elimination of subfamilies, those less sharply marked being merged together, those more clearly defined elevated to family rank.

This minute division of fishes into families is justified by the statement, often used by the author, "that analysis must precede synthesis." It must be remarked, however, that in actual practice analysis seldom has led to synthesis. To use more familiar terms, "splitting" leads to further "splitting," not to "lumping."

It seems impossible to arrive at any conclusion as to whether this multiplication of families is or is not justified. There is no known clear-cut criterion by which to decide whether any natural assemblage of genera should be called a subfamily or a family, or a "series" or suborder. There is, as indeed the present work strongly suggests, a very large if not a preponderating element of the subjective in the estimation of taxonomic rank.

Under each family the pertinent generic names, with authorities and dates, are listed chronologically. With each name is given a page reference to "The genera of fishes," which was published by the same author, in four parts, from 1917 to 1920. That work and "A classification of fishes" will for many years be two of the most used of any works in the libraries of systematic ichthyologists.

Carl L. Hubbs

University of Michigan

## SPECIAL ARTICLES

### BLACKENED SPHERES FOR ATMOMETRY

Since the time when spherical, white, porous porcelain pieces first became available for use in the study of evaporation as one of the influential environmental conditions affecting organisms, it has been clear that black, porous spheres, as well as white ones, are much needed in ecological and physiological instrumentation. Two porous-cup atmometers operating side by side, one equipped with a white and the other with a black sphere, the two spheres being practically alike in all respects excepting as to their ability to absorb radiation, constitute what I have called a radio-atmometer. Rates of water loss from the black member are greater than the corresponding rates of loss from the white during periods of illumination, while both members lose water at the same rate in darkness. The difference between the two rates for any period constitutes a valuable index of the intensity of radiation for that period. The radio-atmometer has already established itself as a valuable instrument in the hands of research workers interested in natural solar radiation as the latter influences the growth of plants, and especially as it accelerates the rate of water loss from their foliage.

Although a supply of rather satisfactory black, porous porcelain spheres was secured several years ago, the supply has recently become exhausted and it will probably be a number of months before another supply will become available, for serious difficulties are encountered in the making of these black pieces. In the *interim* I have tried several proposed methods for blackening the ordinary white spheres. The black materials that can be readily applied to such pieces are subject to removal by the action of rain or else, if they adhere well, they often tend to reduce the water-permeability of the porous porcelain. I have recently employed a coating of lampblack with excellent results in instrumentation wherein rain is not encountered. For rainless periods in the open and for greenhouse studies, these lampblackened spheres are more satisfactory in operation than are any black porcelain spheres thus far secured. The purpose of this note is to bring this simple blackening of the white spheres to the attention of those who wish to employ radio-atmometers for studying solar radiation, etc., in exposures where rain does not occur or for periods without precipitation.

Commercial lampblack is first thoroughly washed by repeated boiling in distilled water, the liquid being thoroughly stirred as it boils. After each boiling it is allowed to settle and most of the water is decanted off, a new supply of water being then added for the next boiling. Four or five boilings and decantings result in a material that settles readily in water and exhibits no oily film. The washed lampblack is preserved under distilled water in a stoppered bottle. It is applied to the porcelain sphere, after the latter has been filled and set up for operation, by means of a small camel-hair brush. The excess of water enters the sphere, leaving a uniform layer of wet lampblack on the outer surface. The black coating remains wet with the highest rates of evaporation and the most intense sunshine, it does not significantly alter the evaporation coefficient of the sphere, as far as conditions other than radiation are concerned, and it acts very satisfactorily as an absorber of radiation. The sphere should be cleaned and recoated about once a week—or oftener if the prepared surface is accidentally in-