

the production of this excellent and valuable piece of work, which could be fittingly entitled "Ichthyology Made Easy", we hope that similar guides for other Zoological Museums in different parts of the world will also be published for the benefit of the

science of Zoology and of its students all over the world. In this production Mr. Norman has set a very high standard and seems to have spared no pains in popularising his subject.

S. L. HORA.

Continents and Oceans.

FROM very early times in the study of the surface history of the earth, the question of the age and origin of the present two main features of the earth's surface—oceanic basins and continental masses—has always attracted considerable attention. This subject has been studied from various points of view within the last sixty years and evidences afforded by studies in several branches of physical and natural science have been put forward from time to time in the discussion of this problem. An admirable and critical review of these ideas has been recently given by Sir Thomas Holland* in his Huxley Memorial Lecture.

So far back as 1846, Edward Forbes considered this problem from the point of view of the ancient distribution of animals and plants, and found it necessary to believe that in the course of geological time, land and sea had often exchanged places. This conclusion was, ten years later, stoutly opposed by J. D. Dana who maintained that "the continents have always been the more elevated land of the crust and the basins always basins",—a view which found favour with several of the foremost naturalists of those days like Darwin, Wallace and Lyell. Huxley himself dealt with this problem in his Presidential Address to the Geological Society of London in the year 1870, and also basing his arguments on the study of the distribution of the fossil faunas at different periods, he pointed out that although it is true that the distribution of land life required considerable vertical movements to form dry land connections, which are non-existent to-day, there had been a "persistence of a general

uniformity in the positions of the great masses of land and water. From the Devonian period or earlier, to the present day, the four great oceans may have occupied their present positions, and only their coasts and channels of communication have undergone an incessant alteration"—thus essentially supporting Dana's idea of permanence. In the year 1890, however, W. T. Blanford in his Presidential Address to the Geological Society of London, issued a definite challenge to this view. Basing his arguments also on palaeobiogeographical studies, he pointed out that the evidence was "distinctly in favour of the assumption that land connections formerly existed across seas that are now covered by broad and deep oceans" and that it was "impossible to reconcile the known distribution of life without past changes in the shapes of the ocean basins far greater than anything that might fairly be described as marginal"—a view in support of which Blanford relied, among other things, on the evidence he and his colleagues had collected in connection with the Gondwana System of India. It will be remembered that on the basis of this work, Edward Suess had, in 1885, actually pictured the existence of a Gondwanaland,—a continent big enough to include South America, South Africa, India, parts of Australia, and Antarctica, with the intermediate areas now covered by the ocean, and which existed, as such, from the later palaeozoic to upper cretaceous times. "Obviously, if the ocean basins and continental masses had the degree of permanence which was assumed by Dana and others who adopted his views, there could have been no Gondwanaland such as the Indian Geological Survey and Suess understood it." In course of time, however, certain difficulties were recognised in accepting the existence of this extensive southern continent and suspicions often

* *The Permanence of Oceanic Basins and Continental Masses.* By Sir Thomas Holland, K.C.S.I., K.C.I.E., D.L., LL.D., D.Sc., F.R.S. Huxley Memorial Lecture 1937. Macmillan & Co., Ltd., London. Price 1s. net.

recurred regarding the reality of Gondwanaland as pictured to us by Blanford and Suess. More recently Charles Schuchert and Bailey Willis have discussed this problem; and the former by his 'Land Bridges' and the latter by his 'Isthmian Links' show that it is possible to provide sufficient land connections for the migration of animals and plants in the past without having to postulate the existence of such a continuous and extensive land mass as the Gondwanaland. Thus both these authors are inclined to hold on to as much of Dana's doctrine of permanency as seemed possible.

At the beginning of this century, this problem of the origin and history of the continents and oceans came to be tackled from an altogether different point of view, and the idea of the possible horizontal displacement to great distances of continental masses—or 'continental drift' as it is now generally called,—was put forward by Taylor and Wegener. This theory very soon attracted considerable attention, since it opened up "new possibilities of migration of land animals and plants, without absolute destruction of the long cherished geologists' pet of permanency for the oceanic basins". Within the last few years, Wegener's theory has been critically examined not only by geologists and paleontologists but also by physicists and mathematicians, and quite a large volume of controversial literature has since grown up. As Sir Thomas Holland points out, a final judgment on the acceptability or otherwise of this theory will have to be given only after accumulating a large number of observations based on close surveys of special areas, and analysing the evidence dispassionately. An admirable beginning in this kind of work has been

made by A. L. du Toit for the two opposite shores of the South Atlantic Ocean and his work in these two areas shows that there is a "remarkable duplication of characteristics of a stratigraphical, paleontological, tectonic, volcanic, and even of a climatic nature"; and he believes that these resemblances are "too numerous and of a kind too significant to be mere coincidences," and leave little doubt "that South America and South Africa have actually travelled 2,000-3,000 miles from one another since the end of mesozoic times". The thing now to do is to follow in the footsteps of du Toit and closely examine other areas and collect more data; for this problem—"whether the oceanic basins and continental masses have ever changed places by vertical rise and fall, or whether the continental fragments have moved superficially to their present positions over the ocean floor"—can be settled only in one way; and that is, as Sir Thomas puts it, "by the patient accumulation of data so numerous and consistent that little room will be left for the assumption of mere fortuitous repetition of similar phenomena."

Within the brief space of about 20 pages, Sir Thomas Holland has in this lecture given us a most lucid and masterly review of ideas on a subject which from the days of Huxley himself has always been coming up for comment and discussion in some form or other. It is a fascinating subject in which not only geologists but various other scientists are greatly interested, and Sir Thomas Holland has done a great service in taking stock, as it were, of our present position in the matter, and pointing the way to further study and research.

L. RAMA RAO.

Sugarcane—Sorghum Hybrids in Wild State.

RELIABLE information has been received that in the wild unexplored parts of New Guinea, plants that are considered by competent authorities to be hybrids between Sugarcane and Sorghum, have been found growing there in the wild state. The Imperial Sugarcane Breeding Station at Coimbatore was the first to artificially produce these intergeneric hybrids, and we

learn that certain of the complicated crosses made at Coimbatore between Sugarcane and Sorghum have thrown out types similar to certain indigenous Indian canes. This suggests the possibility of certain of the Indian canes having originally risen as hybrids between the Sugarcane and the Sorghum.