

Wherever upon islands contiguous to each other or to a continent animals or plants of the same or closely analogous descriptions are observed, it will be found, upon investigation, that the sea between them is shallow; and that where a deep sea divides islands from each other, there entirely different types will be found. An upheaval of only 50 fathoms would make dry land of the whole sea intervening between Borneo, Java, and Sumatra, and the mainland of Malacca and Siam, while the 100-fathom line of soundings includes the Philippines and other groups; from which fact he argues the comparatively recent submergence of this part of Asia. He then adduced a variety of arguments from the zoological world, instancing examples both of Carnivora and Ruminantia which are common to the islands named and to Southern Asia, while they are totally unknown to Australia, yet which could never have reached the islands of the western section from the mainland of Asia so long as the ocean retained its present configuration.

A few anomalies are observable in the Philippines, which could sufficiently be accounted for by the more remote period at which they were cut off from Asia, as indicated by the greater depth of the intervening ocean. The islands, from Celebes and Lombok eastward, present many of the characteristic features of the Australian region, as indicated by the shallow sea and the similarity of fauna and flora between the eastern section of the Indo-Australian archipelago and Australia, while the strait, barely 15 miles wide, between Bali and Lombok, marks the dividing-line between the Asian and Australian kingdoms of natural history. From these various data a general conclusion may be drawn, that all the islands eastward of Borneo and Java formed part of an Australian or Pacific continent, from which they were separated at a period not merely long antecedent to the submergence of the adjacent portion of the Asiatic continent, but probably long before any portion of South-eastern Asia emerged from the waves; basing this conclusion upon the comparatively recent geological formation of Java and Borneo, and on the great depth of the sea between Borneo and the eastern section of the archipelago, which pointed to a very long period during which the two continents of Asia and Australia were widely separated.

Particular attention was called to the fact that the division of the archipelago now pointed out did *not* correspond to any physical or climatal divisions; for the volcanic band runs through both sections, and the climates of Borneo and New Guinea are very similar; yet in spite of these, which are usually deemed the necessary conditions for ensuring similarity of animal life, the most striking contrast between them respectively at once forces itself even upon the most unobservant traveller. The difference between these two sections of the archipelago was further illustrated by showing what would be the consequence of the two continents of Africa and South America becoming joined in the course of ages by the slow upheaval of the Atlantic bed, and the erosive agency of rivers on either continent. If, then, a renewed period of upheavals occurred, islands would have been formed similar to those of the Indo-Australian archipelago, yet equally dissimilar as to natural history. The paper concluded by urging upon naturalists increased devotion to that science, as tending to throw light upon many of the most recondite questions of the earth's previous history.

*On the Geographical Distribution of Animal Life.* By A. R. WALLACE.

The author called attention to the six geographical regions established by Dr. Sclater (Proc. Linn. Soc., Feb. 1858) for ornithology—viz., 1st, the Neotropical, comprising South America and the West Indies; 2nd, the Nearctic, including the rest of North America; 3rd, the Palæarctic, composed of Europe, Northern Asia to Japan, and Africa, north of the Desert; 4th, the Ethiopian, which contains the rest of Africa and Madagascar; 5th, the Indian, containing Southern Asia and the western half of the Malay archipelago; and 6th, the Australian, which comprised the eastern half of the Malay Islands, Australia, and most of the Pacific Islands. It was stated that these regions would apply almost equally well to mammalia, reptiles, land-shells, and insects; but there were some exceptional cases, which it had been thought would render these regions inapplicable to zoology generally. These exceptional cases were—1st, that the batrachians of Japan are Palæarctic, agreeing with the birds, &c.; but the snakes are altogether Indian, as



pointed out by Dr. Günther in his paper on the geographical distribution of reptiles (Proc. Zool. Soc. 1858, p. 373); 2nd, that the mammalia of North Africa are not European, like the birds; 3rd, that the insects of the Moluccas and New Guinea are generally of Indian forms, while the birds and mammals are Australian; and, 4th, that the insects of Chili are of North-Temperate and Australian forms, while the birds and mammals are mostly of true South-American groups. These cases were treated successively; and it was shown that the statement as to the mammals of North Africa was incorrect, and that they really very strongly confirmed the evidence of the birds and reptiles as to that country being Palæartic. In the other cases the anomalies of distribution were explained as being due to special exceptional circumstances, which should not invalidate the general accuracy and usefulness of these divisions. The discrepancies in the distribution of plants, which, while often agreeing with those of insects, were much greater, were supposed to be in a great measure due to the adventitious action of the glacial epoch and of floating ice. In conclusion, naturalists were called upon to furnish detailed information as to the agreement or discrepancies of this system of geographical regions in the groups to which they paid special attention, so that a final conclusion might be arrived at as to the advisability of adopting them for general use.

#### PHYSIOLOGY.

*Address by Professor ROLLESTON, F.R.S., President of the Subsection.*

THE President opened the business of the Subsection by a bibliographical survey of recent physiological works, periodical and systematic. Speaking, firstly, of British periodicals, he observed that the liberality of our various scientific societies in publishing so many volumes of Proceedings in octavo, with illustrations, accounted for the more or less popular character of most other English scientific journals. More strictly and severely scientific papers were to be found on the Continent, in such works as the 'Zeitschrift,' published under the auspices of Siebold and Kölliker, or the 'Archiv' of Reichert and Du Bois Reymond, than we ordinarily saw in publications devoted similarly to biological science, and dependent similarly on public patronage, in Great Britain. The rapidity and readiness with which the societies alluded to published the most rigidly scientific dissertations made them, within these islands, the favourite channel for such communications. On the other hand, the fact that a large number of semi-scientific natural-history periodicals were published in this country proved that a strong taste for such subjects was becoming widely diffused throughout it.

The more exclusively professional and practical medical press gave evidence of a similar tendency in the important section of the community for which it was intended, by the publication of lengthy series of lectures on the more recondite parts of philosophical anatomy, which could scarcely have any very direct bearing on the practical exercise of the art of healing.

Passing from periodical to systematic literature, Professor Rolleston said that there were three great departments, viz. that of experimental physiology, that of structural and especially of microscopic anatomy, and, thirdly, that of comparative anatomy, in which accessions both to our knowledge and to our means of obtaining it, had been recently made. In the department of experimental physiology, Dr. Edward Smith's, Dr. Davy's, Dr. Radcliffe's, and Dr. Pavy's recent works were well known to the Members of the Association, before whom the authors had brought, or would upon the present occasion bring, papers. Whilst upon this subject, Professor Rolleston made some remarks upon vivisection. A defence might be set up for it upon the following grounds, and under the following limitations:—Firstly, in the operations passing under that name, the first thing done in many cases was to extinguish life and sensibility in a manner (as by pithing) as much more speedy than the ordinary methods for the destruction of animals, as the scalpel of the anatomist was a surer and speedier agent than the clumsy tools of the slaughter-house or the uncertain ones of the sportsman. In