must have been still earlier marine periods in the basin.

When the ice of the last glaciation retreated up the Irish Sea it deposited three large moraines. The first runs from Wexford to the Lleyn Peninsula about 320 ft. below modern sea-level, the second from Wicklow to the same point 270 ft. down, and the third from north Dublin to the Isle of Man and thence to England at the same depth. The first moraine may have been quickly drowned by the rising waters of the postglacial sea, but the second and third probably persisted for some time, and provided routes for the postglacial migration of plants and animals into Ireland. If the link between Ireland and the Isle of Man was severed before—but only a short time before—the link between the Isle of Man and Britain, then many of the puzzling features of the modern flora and fauna of the Isle of Man find ready explanation.

TROPICAL CLIMATES AND BIOLOGY

IN his presidential address to Section D (Zoology), Dr. G. S. Carter took as his subject a comparison between the results of tropical and temperate biology, emphasizing especially work in the tropics which has given results not to be expected from our knowledge of temperate biology. As an introduction to his address, he gave a short account of the climatic conditions in the tropics that seem most likely to be biologically important, especially the less-marked seasonal rhythms of tropical climates, and the greater importance of variations in the amount and type of the rainfall in determining the nature of environments.

His first example of biological work in the tropics that has given results unlike those of similar work in temperate regions was investigation of the conditions of life in shallow and stagnant tropical swamps. The waters of such swamps are always markedly and sometimes almost completely de-oxygenated, even close to the surface. This is due to several conditions resulting from the tropical climate and not present in similar temperate waters. Of these conditions the most important are protection from wind disturbance by thick plant growth above the water, absence of overturn in the warm tropical nights, and rapid absorption of any oxygen that reaches the water in the chemical and biological processes of decay at the high temperatures. The faunas of tropical swamps are variously adapted to these conditions. The swamps are the habitat of most of the known air-breathing species of fishes, and the invertebrates show many different kinds of adaptation to life in a de-oxygenated environment.

The distribution of sulphur compounds in African lakes gives a second example of unexpected results in tropical biology. In Lake Victoria and other lakes the sulphur content of the water is very low. But when the mud at the bottom of the lake is examined, it is found that its content of sulphur is extremely high to depths of at least 10–15 m., and, surprisingly, that the sulphur in the mud is almost all in organic compounds. It seems that the fauna absorbs sulphur compounds from the water, which thus becomes denuded of sulphur; the sulphur in their bodies is carried down to the mud when they die; and—this is the surprising feature—the sulphur compounds so brought into the mud do not break down even in the thousands of years needed for the deposition of 10 m. of mud. Sulphur can be returned from the mud to the water only if it is absorbed by the roots of the aquatic plants, which contain a normal concentration of sulphur. No similar situation is known in temperate waters.

The control of seasonal rhythms of breeding and migration in the many tropical environments that are nearly invariable in climate throughout the year is a problem not met with in temperate biology. In equatorial rain-forests the only significant seasonal climatic change is in rainfall, and even in rainfall the variation is more in amount than in frequency, for rain falls at intervals of not more than a few days at any time of the year. Yet even in these environments most species show seasonal periodicity of breeding, and many migrate to other regions at definite times of the year. How these periodicities are controlled and especially whether endogenous rhythms play any part in their control was considered.

Finally, the means by which small mammals are able to maintain their water-balance in desert environments was discussed, and, in conclusion, a plea was made for more work in the wide and still largely unexplored field of tropical biology.

WELSH EMIGRATION OVERSEAS

PROF. E. G. BOWEN, being head of the Department of Geography and Anthropology at the University College of Wales, Aberystwyth, could scarcely have chosen a more apt subject for his presidential address to Section E (Geography) than "Welsh Emigration Overseas". As he points out, Wales has made a very substantial contribution for its size to the peopling of new territories overseas.

In the main, Welsh emigrants have left their homes seeking employment similar to that which they were accustomed to in Wales. They became farmers, miners, quarry workers and tinplate workers in the New World and in Africa; while in earlier times others had left the homeland in search of religious or political freedom. At present, the majority of Welsh people overseas are engaged in commercial, administrative or educational work. In recent years, the historians have gathered together a considerable amount of information regarding Welsh emigration to individual countries, but no one has yet attempted an overall picture, or examined the matter from a strictly geographical point of view. All this has been made possible by plotting the data assembled at Dolgellau by the Society of Welsh People in Dispersion (Undeb y Cymry ar Wasgar). The overall picture brings out most of the points mentioned above.

Special attention has been directed to the Welsh communities in those countries, such as the United States of America and the Argentine, which lie outside the British Commonwealth. The famous Welsh Colony on the banks of the Chubut River in Patagonia is studied in some detail, and much new evidence is made available concerning the prepara-