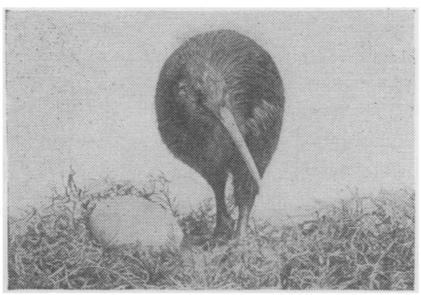
Wingless Birds of New Zealand —A Science Classic



Biology

The wingless Kiwi and its enormous egg. Wallace points out that so long as each living thing was believed a special creation, it was thought that each was perfectly formed to fit its environment. But under the theory of evolution the ancestral forms of each creature and the steps by which the species was molded by its environment bring up a new set of problems for the biologist. New Zealand, Australia, and their neighboring islands with their strange and isolated floras and faunas present problems of exceptional interest.

ISLAND LIFE, or, the phenomena and causes of Insular Faunas and Floras including a revision and attempted solution of the problem of Geological Climates, by Alfred Russel Wallace. New York, 1881.

Almost equally valuable with mammalia in affording indications of geographical changes are the wingless birds for which New Zealand is so remarkable. These consist of four species of Apteryx, called by the natives "kiwis"—creatures which hardly look like birds, owing to the apparent absence (externally) of tail or wings and the dense covering of hair-like feathers. They vary in size from that of a small fowl up to that of a turkey, and have a long slightly curved bill, somewhat resembling that of the snipe or ibis. Two species appear to be confined to the South Island and one to the North Island; but all are becoming scarce, and they will, no doubt, gradually become extinct. These birds are generally classed with the Struthiones, or ostrich tribe, but they form a distinct family, and in many respects differ greatly from all other known birds.

But, besides these, a number of other wingless birds, called "moas," inhabited New Zealand during the period of human occupation, and have only recently become extinct. These were much larger birds than the kiwis, and some of them were even larger than the ostrich, a specimen of *Dinornis maximus* mounted in the British Museum in its natural attitude being eleven feet high. They agreed, however, with the living Apteryx in having four toes, and in the character of the pelvis and some other parts of the skeleton; while in their short bill and in some important structural features they resembled the emu of Australia and the cassowaries of New Guinea. No less than eleven distinct species of these birds have now been discovered; and their remains exist in such abundance—in recent fluviatile deposits, in old native cooking places, and even scattered on the surface of the ground, that complete skeletons of several of them have been put together, illustrating various periods of growth from the chick up to the adult bird. Feathers have also been found attached to portions of the skin, as well as the stones swallowed by the birds to assist digestion, and eggs, some containing portions of the embryo bird; so that everything confirms the statements of the Maoris—that their ancestors found these birds in abundance on the islands; that they hunted them for food; and that they finally exterminated them only a short time before the arrival of Europeans.

Past Changes of New Zealand Deduced from its Wingless Birds.—It has been well observed by Captain Hutton, in his interesting paper already referred to, that the occurrence of such a number of species of Struthious birds living together in so small a country as New Zealand is altogether unparalleled elsewhere on the globe. This is even more remarkable when we consider that the species are not equally divided between the two islands, for remains of no less than ten out of the eleven known species of Dinornis have been found in a single swamp in the South Island, where also three of the species of Apteryx occur. The New Zealand Struthiones, in fact, very nearly equal in number those of all the rest of the world, and nowhere else do more than three species occur in any one continent or island, while no more than two ever occur in the same district. Thus there appear to be two closely allied species of ostriches inhabiting Africa and Southwestern Asia respectively. South America has three species of Rhea, each in a separate district. Australia has an eastern and a western variety of emu, and a cassowary in the north; while eight other cassowaries are known from the islands north of Australia—one from Ceram, two from the Aru Islands, one from Jobie, one from New Britain, and three from New Guinea—but of these last, one is confined to the northern and another to the southern part of the island.

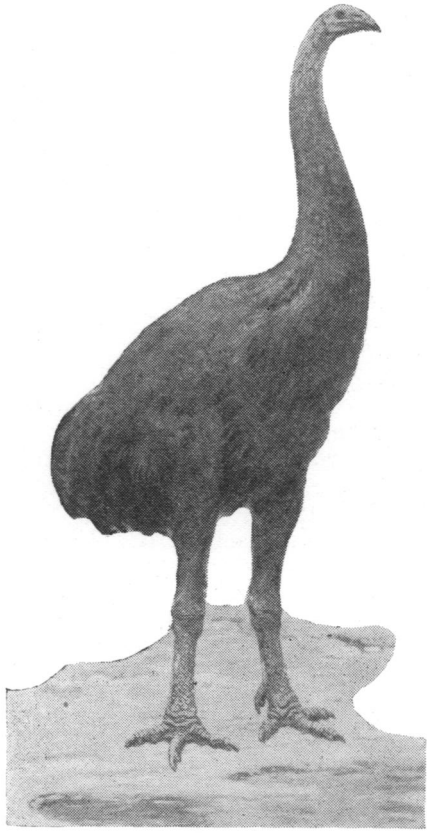
This law, of the distribution of allied species in separate areas—which is found to apply more or less accurately to all classes of animals—is so entirely opposed to the crowding together of no less than fifteen species of wingless birds in the small area of New Zealand that the idea is at once suggested of great geographical changes. Captain Hutton points out that if the islands from Ceram to New Britain were to become joined together, we should have a large number of species of cassowary (perhaps several more than are yet discovered) in one land area. If, now, this land were gradually to be submerged, leaving a certain elevated region, the different species would become crowded together in this portion, just as the moas and kiwis were in New Zealand. But we also require, at some remote epoch, a more or less complete union of the islands now inhabited by the separate species of cassowaries, in order that the common ancestral form which afterwards became modified into these species could have reached the places where they are now found; and this gives us an idea of the complete series of changes through which New Zealand is believed to have passed in order to bring about its abnormally dense population of wingless birds. First, we must suppose a land-connection with some country inhabited by Struthious birds, from which the ancestral forms might be derived; secondly, a separation into many considerable islands, in which the various distinct species might become differentiated; thirdly, an elevation bringing about the union of these

islands to unite the distinct species in one area; and, fourthly, a subsidence of a large part of the area, leaving the present islands with the various species crowded together.

If New Zealand has really gone through such a series of changes as here suggested, some proofs of it might perhaps be obtained in the outlying islands which were once, presumably, joined with it. And this gives great importance to the statement of the aborigines of the Chatham Islands that the Apteryx formerly lived there, but was exterminated about 1835. It is to be hoped that some search will be made here, and also in Norfolk Island, in both of which it is not improbable remains of Apteryx or Dinornis might be discovered.

So far we find nothing to object to in the speculations of Captain Hutton, with which, on the contrary, we almost wholly concur; but we cannot follow him when he goes on to suggest an antarctic continent uniting New Zealand and Australia with South America, and probably also with South Africa, in order to explain the existing distribution of Struthious birds. Our best anatomists, as we have seen, agree that both Dinornis and Apteryx are more nearly allied to the cassowaries and emus than to the ostriches and rheas; and we see that the form of the sea-bottom suggests a former connection with North Australia and New Guinea—the very region where these types most abound, and where in all probability they originated. The suggestion that all the Struthious birds of the world sprang from a common ancestor at no very remote period, and that their existing distribution is due to direct land communication between the countries they *now* inhabit, is one utterly opposed to all sound principles of reasoning in questions of geographical distribution; for it depends upon two assumptions, both of which are at least doubtful, if not certainly false —the first, that their distribution over the globe has never in past ages been very different from what it is now; and the second, that the ancestral forms of these birds never had the power of flight. As to the first assumption, we have found in almost every case that groups now scattered over two or more continents formerly lived in intervening areas of existing land. Thus, the marsupials of South America and Australia are connected by forms which lived in North America and Europe; the camels of Asia and the llamas of the Andes had many extinct common ancestors in North America; the lemurs of Africa and Asia had their ancestors in Europe, as did the trogons of South America, Africa, and tropical Asia. But, besides this general evidence, we have direct proof that the Struthious birds had a wider range in past times than now. Remains of extinct rheas have been found in Central Brazil, and those of ostriches in North India; while remains believed to be of Struthious birds are found in the Eocene deposits of England; and the Cretaceous rocks of North America have

The gigantic Moa, famed in legends of the New Zealanders and extinct just before the coming of white men, was scoffed at by early naturalists until an accumulation of its remains substantiated the tradition of its existence. This figure from a painting by Charles R. Knight in the Field Museum of Natural History, Chicago, shows the way this flightless bird must have looked to the hungry aborigines.



yielded the extraordinary toothed bird Hesperornis, which Professor O. Marsh declares to have been "a carnivorous swimming ostrich."

As to the second point, we have the remarkable fact that all known birds of this group have not only the rudiments of wingbones, but also the rudiments of wings; that is, an external limb bearing rigid quills or largely developed plumes. In the cassowary these wing-feathers are reduced to long spines like porcupine-quills, while even in the Apteryx the minute external wing bears a series of nearly twenty stiff quill-like feathers. These facts render it probable that the Struthious birds do not owe their imperfect wings to a direct evolution from a reptilian type, but to a retrograde development from some low form of winged birds, analogous to that which has produced the dodo and the solitaire from the more highly developed pigeon-type. Professor Marsh has proved that, so far back as the Cretaceous period, the two great forms of birds—those with a keeled sternum and fairly developed wings, and those with a convex keelless sternum and rudimentary wings—already existed side by side; while in the still earlier Archæopteryx of the Jurassic period we have a bird with well-developed wings, and therefore probably with a keeled sternum. We are evidently, therefore, very far from a knowledge of the earlier stages of bird-life, and our acquaintance with the various forms that have existed is scanty in the extreme; but we may be sure that birds acquired wings and feathers, and some power of flight, before they developed a keeled sternum, since we see that bats with no such keel fly very well. Since, therefore, the Struthious birds all have perfect feathers, and all have rudimentary wings which are anatomically those of true birds, not the rudimentary forelegs of reptiles, and since we know that in many higher groups of birds—as the pigeons and the rails —the wings have become more or less aborted, and the keel of the sternum greatly reduced in size by disuse, it seems probable that the very remote ancestors of the rhea, the cassowary, and the Apteryx were true flying birds, although not perhaps provided with a keeled sternum, or possessing very great powers of flight. But, in addition to the possible ancestral power of flight, we have the undoubted fact that the rhea and the emu both swim freely, the former having been seen swimming from island to island off the coast of Patagonia. This, taken in connection with the wonderful aquatic ostrich of the Cretaceous period discovered by Professor Marsh, opens up fresh possibilities of migration; while the immense antiquity thus given to the group, and their universal distribution in past time, render all suggestions of special modes of communication between the parts of the globe in which their scattered remnants *now* happen to exist altogether superfluous and misleading.