the plant a very peculiar aspect. This variety was originally introduced from Inverness-shire, and has been cultivated many years in the Garden at Lochar.

A letter was read from Mr. Hailstone, mentioning that he had gathered specimens of *Cynosurus echinatus* near Thorpe Arch, Yorkshire.

Mr. J. T. Syme exhibited a specimen of *Melilotus arvensis* picked between Inverkeithing and Limekilns. This plant has been observed in several spots near Edinburgh, more especially at St. David's and other parts of Fife.

Dr. Balfour exhibited a specimen of *Eriophorum alpinum* picked by him in Durness, Sutherlandshire, 21st August 1827, when accompanying the late Professor Graham on a botanical trip. Dr. Balfour stated that, at that time, he had just commenced the study of botany, and that the plant was put by him among specimens of *Scirpus cæspitosus.*

IPSWICH MUSEUM.

"On the Gigantic Birds of New Zealand, and on the Geographical Distribution of Animals:" the substance of a Lecture delivered at the Anniversary Meeting of the Ipswich Museum, by Professor Owen.

After some appropriate introductory remarks, Professor Owen entered upon the subject of his discourse by narrating the circumstances which first brought to his knowledge the fact of the existence, at some former period, if not at the present time, of gigantic birds, incapable of flight, in the islands of New Zealand. He exhibited a single fragment of bone, which had been submitted to him in 1839, which was affirmed to have been found in New Zealand, and he defined the steps in the series of comparisons which led to the conclusion that it must have formed part of a bird as large as the Ostrich, but of a heavier and less agile species. He next gave an account of the different species of wingless or struthious birds which were known to science at that time; he more especially described the Apteryx of New Zealand, and the Dodo of the Mauritius; and pointed out the remarkable character of their geographical position. The progressive steps in the restoration of the probably extinct wingless birds of New Zealand were then explained and illustrated by the plates of the works which Professor Owen had published on the subject, and by enlarged diagrams. The importance attached to the first fragment of bone stimulating the colonists to special researches, the remains of these extraordinary birds, which had escaped the notice of Banks and Solander, and successive naturalists, up to the year 1839, were soon obtained, and in unexpected abundance and perfection. The bones of the leg were first transmitted in October 1843, by the Rev. Mr. Williams, a church missionary, now Archdeacon of the Diocese of New Zealand. Casts and figures of some of the most remarkable of these bones were exhibited and explained. They indicated at least five distinct species, varying in height from three feet to eleven feet. The average stature of the Ostrich is six feet. The absence of air-cells in these bones, and their dense structure, confirmed the original

deduction as to the terrestrial character of the birds, and the relative shortness of the ankle-bone (metatarsus) as compared with that in the Ostrich, proved the original surmise as to the more sluggish character of the bird to have been correct.

Successive sets of bones of the great extinct birds were subsequently acquired, either by purchase or donation, by Professor Owen, who in 1846 published his third memoir on the subject, describing the structure of the back-bone (vertebræ) and the breast-bone (sternum) of the Dinornis. The latter he described as one of the most characteristic bones in the skeleton of a bird; it usually presents a part called the "keel," the depth of which is in the ratio of the size and power of the muscles used in flight, the keel being totally wanting in birds that are unable to fly. Thus the breast-bone resembles a shield in the Ostrich, Emeu, Cassowary, and Apteryx, but each of the existing wingless birds has the shield-shaped sternum of a peculiar pattern. The sternum of the Dinornis was equally devoid of a keel, and in its shape it most resembled the sternum of the Apteryx. From the size and strength of a bone of the neck (cervical vertebræ), also described and figured in the third memoir, the author had been led to certain inferences as to the kind of food on which these gigantic birds found subsistence in the small island to which they had been so singularly restricted; but still the head and beak were wanting, upon which any precise idea of the food of the species could be founded.

In 1847, the researches of Mr. Walter Mantell in New Zealand were rewarded by the discovery of the much-wished-for bones of the head and beak, and these specimens formed the subject of a memoir, published in 1848, in which they were described and figured, and referred to four distinct genera of birds. To two of these genera belong the largest bones of the wingless birds that have been discovered in New Zealand. They were called Dinornis and Palapteryx respectively. Magnified diagrams of the skull and beak of each were exhibited and explained by the Professor; who concluded by some general remarks on the geographical distribution of the known existing and extinct birds, the laws or conditions of which were illustrated by analogous facts in the distribution of the species of quadrupeds.

Had all the terrestrial animals, he observed, that now exist, diverged from one common centre within the limited period of a few thousand years, it might have been expected that the remoteness of their actual localities from such ideal centre would bear a certain ratio with their respective powers of locomotion. With regard to the class of Birds, one might have expected to find that those which were deprived of the power of flight, and were adapted to subsist on the vegetation of a warm or temperate latitude, would still be met with more or less associated together, and least distant from the original centre of dispersion, situated in such a latitude. But what is the fact? The species of no one order of birds is more widely dispersed over the earth than the wingless or struthious kind. Assuming that the original centre has been somewhere in the south-western mountain range of Asia, there is but one of the species of flightless birds whose habitat can be reconciled with the hypothesis. By the neck of land still

uniting Asia with Africa, the progeny of the primary pair created or liberated at the hypothetical centre might have travelled to the latter continent, and there have propagated and dispersed themselves southward to the Cape of Good Hope. It is remarkable, however, that the Ostrich should not have migrated eastward over the vast plains or steppes which extend along the warmer temperate zone of Asia, or have reached the southern tropical regions; it is in fact scarcely known in the Asiatic continent, being restricted to the Arabian Deserts, and being rare even in those parts which are most contiguous to what we may call its proper continent—Africa. If we next consider the locality of the Cassowary, we find great difficulty in conceiving how such a bird could have migrated to the islands of Java, the Moluccas, or New Guinea, from the continent of Asia. The Cassowary is not web-footed like the swimming birds; for wings it has only a few short and strong quills. How could it have overcome the obstacles which some hundreds of miles of ocean would present to its passage from the continent of Asia to those islands; and furthermore, how is it that no individuals have remained in the warm tropical southern border of Asia, where the vegetable sustenance of the Cassowary seems as abundantly developed as in the islands to which this wingless bird is now exclusively confined? If the difficulty already be felt to be great in regard to the insular position of the Cassowary, it is still greater when we come to apply the hypothesis of dispersion from a single centre to the Dodo of the island of Mauritius, or the Solitaire of the island of Rodriguez. How, again, could the Emeu have overcome the natural obstacles to the migration of a wingless terrestrial bird from Asia to Australia? and why should not the great continent of Asia have offered in its fertile plains a locality suited to its existence, if it ever at any period had existed on that continent? A bird of the nature of the Emeu was hardly less likely to have escaped the notice of naturalist travellers than the Ostrich itself; but save in the Arabian Deserts, the Ostrich has not been found in any part of Asia, and no other species of wingless bird has ever been met with on that continent: the evidence in regard to such large and conspicuous birds was conclusive as to that fact. In order that the Rhea, or three-toed Ostrich, should reach South America, by travelling along that element on which alone it is organized and adapted to make progress, it must, on the hypothesis of dispersion from a single Asiatic centre, have travelled northward into the inhospitable wilds of Siberia: it must have braved and overcome the severer regions of the arctic zone: it must have maintained its life with strength adequate to the extraordinary power of walking and running over more than a thousand miles of land or frozen ocean utterly devoid of the vegetables that now constitute its food, before it could gain the northern division of America, to the southern division of which it is at present, and seems ever to have been, confined. The migration in this case could not have been gradual, and accomplished by successive generations. No individual of the large vegetable-feeding wingless bird that now subsists in South America could have maintained its existence, much less hatched its eggs, in

arctic latitudes, where the food of the species is wholly absent. If we are still to apply the current hypothesis to this problem in Natural History, we must suppose that the pair or pairs of the Rhea that started from the highest temperate zone in Asia capable of sustaining their life, must have also been the same individuals which began to propagate their kind when they had reached the corresponding temperate latitude of America. But no individuals of the Rhea have remained in the prairies or in any part of North America—they are limited to the middle and southern division of the South American continent. And now, finally, consider the abode of the little Apteryx at the Antipodes, in the comparatively small insulated patch of dry land formed by New Zealand. Let us call to mind its very restricted means of migration—the wings reduced to the minutest rudiments, the feet webless like the common fowl's, its power of swimming as feeble! How could it ever have traversed six hundred miles of sea, that separate it from the nearest land intervening between New Zealand and Asia? How pass from the southern extremity of that continent to the nearest island of the Indian Archipelago, and so from member to member of that group to Australia—and yet leave no trace behind of such migration by the arrest of any descendants of the migratory generations in Asia itself, or in any island between Asia and New Zealand?

If these facts were inexplicable on the hypothesis of the dispersion of the species of the air-breathing animals from a singular Asiatic centre, we must next endeavour to collect analogous facts, and classify them, and so try to explain intelligibly, *i. e.* agreeably with the facts, the true law or cause of the actual geographical distribution of animals. The time allotted to the lecture obliged the Professor to limit his remarks on this subject to the quadrupeds of the class Mammalia.

The dry land of our planet might be divided, in relation to this inquiry, into the following parts:—1. Asia and Europe, which obviously formed one natural tract or continent; 2. Africa; 3. North America; 4. South America; 5. Australia; 6. Scattered islands, as New Zealand, separated by hundreds of miles of sea from any continent. The most characteristic aboriginal quadrupeds of the first division were the elephant, rhinoceros, ox, deer, tiger, bear, hyæna, beaver, hares and rabbits, certain kinds of ape and monkey. In Africa, the quadrupeds were for the most part similar as to genus, but different in species. The elephant differed in the structure of its teeth and feet from that of Asia. The rhinoceros of Africa had two horns, that of Asia one horn. The camel of Asia has two humps, that of Africa one hump. The lion represented in Africa the tiger of Bengal. The hyæna of Southern Africa was spotted, that of Asia was striped. There were also several quadrupeds of which no species now exists in Asia, and which are peculiar to Africa; *e. g.* the hippopotamus, the giraffe, the orycteropus, &c. Africa is also remarkable for its numerous species of large antelopes, of which but few exist in Asia, and none at all in America. In the northern division of the American continent, many of the mammalian genera

of the old world were represented, but by distinct species. The black bear of North America differed from the brown bear of Europe; the bison from the aurochs, or any other bovine animal of Europe, Asia, or Africa. The beaver of Canada was distinct from the beaver of Europe; but there were some genera of the smaller quadrupeds quite peculiar to North America.

When we come to compare the mammalia of South America, almost every aboriginal species belongs to a genus unknown in any other part of the world. The monkeys which abound in the tropical part of this continent differ from those of the old world by having an additional number of certain teeth, and, for the most part, a prehensile tail; they have also a different physiognomy—the nostrils are wider apart, giving greater breadth and flatness to the nose: this is the case without exception among the South American monkeys, whence they are called *Platyrhines* in Systematic Natural History. All the monkeys of the Old World, equally, without exception, have the nostrils approximated, and they are called *Catarrhines*: none of them have the prehensile tail. This fifth member in the *Platyrhine* group gives them additional power of grasping and climbing—makes them even more peculiarly arboreal; and a similar relation to a forest country may be traced through most of the peculiar forms of South American mammalia. The sloths are so expressly adapted for living in trees, that every other kind of life and mode of locomotion has been sacrificed, so to speak, to the perfection of their organization as climbers. Much compassion has been wasted upon their helpless condition when contemplated in their awkward attempt to move on level ground—the common theatre of the activities of mammalian quadrupeds. At the foot of these trees lived the races of armadillo and ant-eater, also peculiar to South America. Both were destined to feed on the countless swarms of termites that subsist on the decaying timbers, and the armadillos were particularly protected by their bony armour from the effects of falling boughs and trees.

In Australia the native quadrupeds were not merely distinct in species and genus from those in other parts of the world, but belonged to a peculiar division of the class Mammalia, characterized by a portable nest for the young, called the "marsupium." Some of these "marsupial" animals were carnivorous, others herbivorous,—some terrestrial, others arboreal,—some were burrowers, others swimmers: among the latter was the curious Ornithorhynchus, with the tail of a beaver, the skin of a mole, the beak of a duck, and the spurs of a cock. These creatures performed in Australia all the parts which the other kinds of quadrupeds performed on the larger continents, but were of a different and lower grade of organization. New Zealand was remarkable for the total absence of any aboriginal species of terrestrial quadruped. Those that now abound in the island had been imported by the colonists from Europe, and there was no natural obstacle to their well-being and increase in New Zealand.

Finally, the Professor entered upon the question—How long has this geographical distribution of animals prevailed upon the earth? and showed that the results of the acquisition and determination of

the fossil remains of the animals buried in the newer tertiary strata, established the fact that in Europe and Asia, during the period antecedent to any natural evidence of the existence of man, the same peculiar forms of mammalia, which he had cited as now characteristic of that tract of dry land, were distributed abundantly over that great natural continent, from which England had not then become separated. That in South America, instead of elephants, rhinoceroses, oxen, deer, bears, hyænas, &c., there were found, in the freshwater deposits of the corresponding period, fossil remains of sloths, armadillos, ant-eaters, many of them of larger size than the existing kinds, and some, as the megatherium *e. g.*, gigantic. That in Australia the bone-caves and newer tertiary deposits had already revealed fossil remains of both existing and extinct "marsupial" animals, some also of gigantic bulk, and all allied or belonging to the present peculiar genera of that continent. But that no fossil relic of any genus or species of quadruped known in the rest of the world had been found in Australia. Lastly, in New Zealand, the strata contemporary with those from which the fossil quadrupeds above mentioned had been obtained, had not been found to contain the fossil remains of any species of land quadruped, but abounded in the remains of the wingless birds allied to the little Apteryx, now peculiar to New Zealand, but of larger dimensions, and some towering to the extraordinary height of eleven feet.

MISCELLANEOUS.

Notice of specimens of the Wheat Midge from Nova Scotia.

By J. W. Dawson.

This destructive little creature has, within the last four or five years, extended its ravages to Nova Scotia. It made its appearance first in the western counties, and has gradually extended its limits eastward. It is now found in every part of the province, and has, in some districts, caused an almost total abandonment of wheat culture. The specimens accompanying this notice were reared from the larva state; and as I believe this has not often been attempted with success, I shall shortly state the means by which they were obtained.

When I first became acquainted with this insect, I procured specimens of the full-grown larvæ and placed them in a phial, with the view of observing their assumption of the perfect state in spring. None of them however appeared, and I subsequently learned that similar experiments had been tried without success; the belief among entomologists being, that the larva descends into the ground to complete its changes. I could not however ascertain that this belief had been confirmed by actual experiment or observation.

To satisfy myself on this point, (obviously of importance in reference to the means which may be devised for destroying these animals,) I obtained a fresh supply of the larvæ in that motionless and apparently torpid state in which they are found in the ripe wheat in autumn. In the month of November, a few dozens of these larvæ were