

the petals in pieces and scattering them on the ground, to enable them to reach the nectary, which is situated about on a level with the soil; but of late they have altered their tactics and simply bruised the perianth tube sufficiently to extract the nectar, leaving the bloom uninjured but fallen over as though killed by severe frost. The primroses have hitherto escaped, but this spring for the first time the sparrows have attacked the blooms of a cherry-tree, bruising the nectary between their mandibles, and generally detaching the blossom from the foot-stalk close to the calyx. That in both cases this is the work of sparrows I have had ample opportunities of observing. Some years ago a border of Virginian stock which was in full bloom appeared mysteriously to be growing thinner every day. I accidentally saw from a window the sparrows vigorously engaged in pulling up the plants, which they could only do by great exertion, and flying off with them to form their nests. This lasted till the whole were carried away. The fact of the sparrows having altered their form of attack on the crocuses, going direct to the nectary instead of pulling the flowers to pieces, would seem to indicate that the habit is acquired, and not inherited; it also appears, so far as I can learn, to be an increasing habit with them.

Mr. A. F. Buxton, of Cambridge, has frequently observed the same fact about primroses in a wood near Ware. He says:—

I could give no satisfactory explanation of the phenomenon, if it were not that I have noticed the propensity of tame bullfinches to act in the same way towards flowers, especially primroses. In the wood I speak of, bullfinches are abundant; but whether or not they are the only birds which act thus I am of course unable to decide.

Mr. W. E. Hart, of Kilderry, co. Donegal, states that the primroses there suffer much every spring in the manner described by Mr. Darwin. The cowslips and oxlips are seldom, if ever, touched. Mr. Hart says:—

The blame is commonly laid upon the chaffinch, though I have only been able to gather circumstantial evidence against it. I have frequently disturbed both chaffinches and greenfinches from primrose-beds, and found the cut-off flowers strewn about. One lady tells me that she once saw a thrush deliberately cut off a number of primrose flowers in her garden, turning each time to stare defiantly at her. Another has frequently seen hedge-sparrows do so. Thus it appears that several different species of birds have acquired the same habit.

J. M. M. has cultivated polyanthes at Sidmouth, South Devon, for seven or eight years, and each year they have been more or less destroyed by birds, as described by Mr. Darwin. She does not remember to have noticed it till she came to Sidmouth. The wild primroses suffer also, but not, she thinks, to any great extent, though they are abundant in the neighbourhood.

Another correspondent, writing from Poplar, informs us that many years ago he became aware of the fact that flowers containing nectar are attacked by some small animal; having had a bed of crocuses in his garden, the flowers of which were morning after morning destroyed by, he believes, the sharp bills of the sparrows. He, however, suggests that mice frequently might have been the depredators, "as last year," he says, "they destroyed all the grapes in my greenhouse. They are just able to reach such flowers as the crocus and primrose, and they are very hard up at the early season when these delights appear."

M. T. M. mentions, "on the authority of a good observer," that the flowers of the laburnum are sometimes utilised in nest-building by suburban sparrows, "whose destructive habits in the matter of crocuses," he says, "are only too well known to suburban gardeners."

Mr. C. H. Beasley, of Liverpool, writes, that he had a canary some years ago which was particularly fond of primroses, and always bit them in the manner described by Mr. Darwin, usually leaving everything but the part containing the honey untouched. As this peculiarity was exhibited by a domesticated bird, he thinks it highly probable that it was inherited.

THE LECTURES AT THE ZOOLOGICAL SOCIETY'S GARDENS

III.

MR. SCLATER commenced his fifth and concluding lecture on the geographical distribution of the mammalia, by impressing the importance of precise definition of the exact localities from which zoological specimens are obtained. He showed that by further careful collecting, new animals, even of considerable size, most probably remain to be discovered, considering that a previously unknown rhinoceros and a fresh genus of deer had been made known within the last three years.

The importance of the geographical distribution of the larger divisions of the mammalia is well illustrated in the case of the *Bassaris* of Mexico, an animal supposed for a long time to belong to the civet cats, which are peculiar to the Ethiopian and Indian regions, but now known in its internal structure to agree with the racoons, which are typically American forms. So also the so-called musk deer are often said to inhabit northern Asia, India, and Africa, but there is only a single species of the true musk deer, which is from northern Asia, whilst the Tragulidæ (with which it has been erroneously united) form quite an independent group, found in India and Africa.

The facts given in the preceding lectures suggest the question as to how the world may be most naturally divided according to the distribution of the animal life upon it, which is part of the great problem of the distribution of organic life generally; and it is evident that all great deductions made from any one group must in the long run correspond with those from other groups.

At the outset it is evident that the ordinary geographical divisions of the world do not hold. Europe must be combined with the northern part of Asia, and also with Africa north of the Atlas Mountains. In the same way central America and part of Mexico have to be included with South America. Taking the division of the mammalia into Monodelphs, Didelphs, and Ornithodelphs, the peculiarities of their distribution are very instructive: dividing the surface of the earth into four major divisions—1. *Arctogæa*, or North Land; 2. *Dendrogæa*, or Tree Land; 3. *Antarctogæa*, or South Land; and *Ornithogæa*, or Bird Land.

Arctogæa is divisible into four minor regions—(a) the Palæarctic, (β) the Ethiopian, with the Lemurian sub-region of Madagascar, (γ) the Indian, and (δ) the Nearctic. The Palæarctic region possesses few characteristic families and genera. Its boundaries, as are those of all regions except when sea-bound, are ill-defined; Palestine, for example, is doubtful. *Quadrumana* are almost entirely absent; *Rhinopithecus*, a Tibetan form, belonging, apparently, to the region. The genera *Elurus* and *Cayra* are characteristic forms. Bears are mostly confined to it, some being, however, found in North America and one in South America. Among the Ungulata, the genus *Equus* is more truly Palæarctic than otherwise, and *Cervu* are abundant.

The Ethiopian region embraces Africa south of the Sahara. The genera *Troglodytes*, *Colobus*, *Cercopithecus*, and *Cynocephalus* are characteristic, as are *Hyæna*, *Proteles*, *Lycaon*, *Hippopotamus*, *Camelopardus*, and others. Madagascar forms a well-marked sub-region, containing no antelopes nor cats, but *Lemur*, *Chiromys*, and *Cryptoprocta*. It is the true home of the lion.

The Indian region extends along Southern Asia to Wallace's line in the Malay Archipelago. The only ruminant animal in the Indian Archipelago is the peculiar *Anoa depressicornis*.

The Nearctic region is very much like the Palæarctic. *Castor*, *Gulo*, and *Lynx* are common to the two. *Taxidea*, *Procyon*, and *Antilocapra* are characteristic, whilst *Didelphys* has entered from the south.

The Neotropical region (*Dendrogæa*) possesses great individuality, *Cebus*, *Hepale*, *Icticyon*, *Nasua*, and

Cercoleptes being characteristic. Hystricidæ abound, and Ruminants are very badly represented, only lamas, peccaries, and tapirs being found. Sloths, armadillos, and opossums are not found elsewhere, and there are no frugivorous bats, Insectivores, Viverridæ, nor elephants. The West India Islands form a well-marked (Antillean) sub-region, possessing Solenodon, and peculiar Rodents.

The Australian region, including Australia and the Malay Archipelago up to Wallace's line (or *Antarctogæa*), is characterised by the presence of the Monotremes and Marsupials. Lastly New Zealand (*Ornithogæa*) has no Mammals at all except two Bats.

Mr. Sclater, in conclusion, explained the different answers which had been given to the question: Why are animals thus distributed? showing that the Darwinian hypothesis is a key to the whole subject, rendering quite simple most of those difficulties which were previously insurmountable.

CAMPHOR

THE camphor of commerce, it is well known, is the produce of *Camphora officinarum* Nees., a tree of China and Japan. To obtain it the wood is cut up into pieces and boiled in water, when the camphor is deposited. It is afterwards purified by sublimation, and further refined after its arrival in this country. Immense quantities of this article are imported from Singapore, and though so valuable in European commerce, in Sumatra and Borneo a much higher value is put upon that known as Sumatra camphor, which is obtained from *Dryobalanops aromatica* Gaert. (*D. camphora* Coll.), which does not come to this country as an article of trade. Besides these there is a third kind of camphor, known in China as Ngai camphor; this, in point of value, stands between the ordinary commercial article and the Malayan or Sumatra camphor. Its botanical source has for a long time been doubtful, but it has generally been attributed to an unknown species of *Artemisia*. Mr. D. Hanbury, however, who has done so much in clearing up doubts on the botany of many of our important articles of trade, more especially in relation to drugs, has recently, in a paper read before the Pharmaceutical Society, identified the plant with *Blumea balsamifera* D.C. It is a tall, herbaceous plant, and has long been known for the powerful smell of camphor emitted from the leaves when bruised. It is common in Assam and Burma, and indeed throughout the Indian islands.

The materials from which Mr. Hanbury has been enabled to solve the problem of the origin of this peculiar camphor were sent him from Canton, and consisted of a small branch of the plant, and specimens of the camphor itself. These specimens, he says, "represented two forms of the camphor—the one a perfectly colourless crystalline substance, in flattish pieces as much as an inch in length;" the other, which was sent as crude camphor, was a crystalline powder of a dirty white colour, mixed with some fragments of vegetable tissue. "The purer sample has an odour scarcely distinguishable from that of ordinary camphor; but the odour of the other is perceptibly contaminated with a smell like that of worm-wood." This camphor, though seldom seen in this country, was at one time attempted to be brought into commerce, one hundred pounds of it having been made in Calcutta. It is used in the East, both in medicine and in the manufacture of the scented Chinese inks. It is stated that "about 15,000 dols. (3,000*l.*) worth is annually exported from Canton to Shanghai and Ningpo, whence it finds its way to the ink-factories of Wei-chau and other places."

Though it is now proved that *B. balsamifera* is the plant yielding the bulk of the Ngai camphor, it is not improbable that some other plants lend their aid, for the term "Ngai" is, it appears, applied to several belonging to the Labiatae and Compositæ. JOHN R. JACKSON

THE "SPAR CAVES" OF THE NORTH BRIDGE, EDINBURGH

THE North Bridge, which spans the deep valley lying between the Old and New Towns of Edinburgh, was built upwards of a hundred years ago, and its huge arches must be familiar to all who have entered Edinburgh from the south by railway, the terminus for the main southern lines being situated just below. Between the arches of the bridge and the roadway above are a number of chambers or vaults which have not been opened, till recently, since the bridge was built. In carrying out the operations necessary for the widening of the now too narrow bridge, these vaulted chambers have been opened up, and one of them has been visited by Prof. Geikie, who, in a communication to the *Scotsman*, describes the wonderful sights he saw.

"The chamber we examined," he says, "was about eight or ten feet broad, and varied in height according to the rise and fall of the floor over the arch underneath, the floor coming sometimes so near the roof that we needed to stoop low to get through. From the vaulted ceiling, and especially from the joints of the masonry, hung hundreds of 'stalactites'—delicate spar icicles of snowy whiteness. In many cases they reached to the floor, forming slender thread-like pillars. In making our way we were under the necessity of brushing down many of these pendant masses. Now and then we seemed to be marching through a grove of white and brittle canes. The longest entire one we could see measured rather more than six feet in length. Usually they were slim stalks somewhat like thick and not very well-made tobacco-pipes, but towards the sides of the vaults they became thicker and stronger, one which we carried off measuring about four feet in length, and as stout as an ordinary walking-stick. The same material as that forming the stalactites spread in ribbed sheets down the sides of the vault. The floor, too, was dotted all over with little monticules of the same snow-white crystalline spar.

"A more illustrative example of a stalactitic cavern could not be found. The whole process was laid open before us in all its stages. Along the joints of the masonry overhead could be seen here and there a drop of clear water ready to fall. At other places the drop hung by the end of a tiny white stone icicle, to which it was adding its own minute contribution as it evaporated. From the mere rudimentary stumps the stalactites could be traced of all lengths until they were found firmly united to the spar hillocks on the floor. Every one of these hillocks, too, lay directly beneath the drip, catching the remainder of the stone dissolved in the dropping and evaporating water. In every case the stalactites were tubes; even the thickest of them, though it had undergone great changes from deposit on its outer surface, retained, nevertheless, its bore. Usually there hung a clear water-drop from the end of the stalk, ready to descend upon its white stony mound beneath.

"So far, except for the undisturbed perfection of the whole, there was nothing which may not be seen under many an old vault. But what astonished me most was the evidence of a continuous growth and destruction of these slim stalks of stone during an actually known period. In a great many cases the little 'stalagmite' mounds were each surmounted by a short slender stalk, as the Calton Hill is by Nelson's monument. There could be no doubt that these monumental-looking objects were merely the lower ends of once-continuous stalactite pillars. And indeed, searching round the mound I could usually find fragments of the broken column imbedded in the growing stalagmite. What had broken them? Perhaps a heavy omnibus thundering overhead, or a laden lorry or a deftly-fired royal salute. Anyhow, for a hundred years