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 wormwood." 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 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 Labiatæ 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

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this delicate tapestry has been hanging and growing, and breaking and growing again, quietly in darkness, beneath the grind of our carriage wheels, and yet high in air, with the stream of human life flowing underneath it too. Alike in the pendant stalks, on the walls, and in the mounds on the floor, the prevailing colour of the crystalline incrustation is pure white. These caves in middle air have been shut up from the contamination from town smoke. Now and then, however, the dripping water has come upon soluble iron as well as lime. Hence the mounds on the floor are sometimes curiously coloured yellow, brown, and red.

"As the bridge is built of sandstone, wholly or almost wholly free from lime, it is evident that the material which has converted these vaults into such picturesque caverns has been derived from the mortar. All rain-water, as is well known, takes up a little carbonic acid from the air, and of that acid there is in the air of a town usually more than the normal proportion. Filtering through the masonry, it dissolves the lime, carrying it downward in solution, and, if made to halt and evaporate, depositing it again in the form of the white crystalline substance which we call spar. It would be a curious question for the architect how long his masonry could resist this action. Certainly, in spite of what these vaults in the North Bridge reveal, the masonry of that structure is to all appearance as solid and firm as ever. It is evidently impossible, however, that the mortar, if necessary at all, can be piecemeal removed without in the end causing the destruction of a building."

REPORT OF PROF. PARKER'S HUNTERIAN LECTURES "ON THE STRUCTURE AND DEVELOPMENT OF THE VERTEBRATE SKULL" *

III.

IN the types already considered, the exo-skeleton consists of small placoid scales having the structure of teeth, and imbedded in the skin, but being altogether irrelative to the true cartilaginous endo-skeleton. In the group of fishes which form so perfect a mean between these Elamobranchs and the osseous fish—the Ganoids—the body is covered with close-set "ganoid" scales, which consist of two layers, a deeper one of bone (dermostosis), and a superficial one of enamel, covered only by a thin layer of epidermis. In the head these scales pass insensibly into a set of bones in close relation with the chondro-cranium, and having the connections, positions, &c. which characterise the roofing-bones of one of the higher skulls (parietals, frontals, nasals, &c.). In many cases these bones are so deeply imbedded in the subcutaneous tissue as to deserve the name rather of parostoses than of dermostoses, but are always easily removed by maceration or boiling. They are evidently of an entirely different nature to another series found in the same skulls, but in intimate connection with the cartilage, and only separable by its entire destruction. These last are ossifications of the chondro-cranium, and are often spoken of as "cartilage-bones;" the former kind have only a secondary relation to the primordial skull, and are known as "membrane-bones."

In the osseous fish both these varieties of bone appear, but the investing or membrane-bones are all true parostoses developed in the deeper subcutaneous tissue, and the place of the ganoid dermostoses is taken by cycloid or ctenoid scales. Still the insensible gradation between scales and skull-bones is very apparent: along the side of the trunk passes a series of curious tubular or grooved bones containing mucous glands and known as the "lateral line series;" these, on reaching the head, branch out so as to produce a tree-like arrangement instead of a single row, and the burrowing is now, not in a set of modified scales, but in true cranial bones, some belonging to the opercular apparatus, some to the series above and below the eye.

IV.—*Skull of the Salmon* (Salmo salar).—In the Teleostean the investing bones attain a greater development than in any other group, and, in the description of the salmon's skull, will be considered before the cartilage-bones which they overlie, and from which they come away with great ease by maceration.

There are, in the first place, on the upper surface of the skull, three pairs of bones and a single median ossification. Of these, a pair of small bones, separated from one another by a considerable interval, and lying over the auditory region, answer to the parietals (Fig. 7, Pa); a much larger pair roofing over all the central portion of the brain case, from the parietals behind to the nasal region in front, are the frontals (Fr); and a very small and insignificant pair situated just above the nasal sacs the nasals (Na). All these are well known from their occurrence in the higher animals; but the bone marked S.Eth (super-ethmoid), which lies between the nasals and over the cartilage separating the olfactory organs, is peculiar to certain osseous fishes.

Above the eye is a small bone, known as the supra-orbital (S.Or), and below and at its sides a chain of bones, deeply excavated by slime-glands, the sub-orbitals (Sb.Or); the most anterior of these (Lch) seems to answer to the lachrymal bone of the higher animals. The gape of the mouth, instead of being formed, as in the shark and ray, by the naked pterygo-palatine and Meckelian cartilages, is bounded entirely by membrane-bones, three in the upper jaw, the pre-maxilla (Pmx), maxilla (Mx), and malar or jugal (Ju), and one in the lower, ensheathing Meckel's cartilage, the dentary (D). The maxilla, unlike that of most typical Teleosteans is dentigerous, and takes a large share in the formation of the gape. Immediately below the angle of the lower jaw is situated a small bone, the angular (Ang).

Two very important parostoses occur on the under surface of the skull, where they clamp and strengthen the cartilage; these are the vomer (Fig. 8, Vo), which bears a few teeth, and the para-sphenoid (Pa.S), the enormous development of which is so characteristic of the bony Ichthyspsida.

Lastly there are the bones supporting the gill-cover, or operculum proper, and branchiostegal membrane, each of which has its own set of osseous strengthenings. In the first set are included the opercular (Op), sub-opercular (S.Op), pre-opercular (P.Op), and inter-opercular (I.Op); in the second, the branchiostegal rays (Brs.R). The operculars are also divisible into two categories; two of them—the pre- and inter-opercular—are developed in the fold of skin growing from the mandibular arch, which covers the cleft (existing only in the embryo) between it and the hyoid (Fig. 1, p. 425, Ty.Eu), while the remaining two belong in like manner to the operculum of the hyoid arch covering the branchial slits (Fig. 1, Cl^1). The pre-opercular is interesting as being the homologue of the lower part of the mammalian squamosal, and the inter-opercular as representing the tympanic, the two membrane-developed ossifications of the complex temporal bone of human anatomy. The branchiostegal rays are flat sabre-like bones, twelve in number, attached to the hinder edge of the hyoid apparatus. In most Teleostei these bones are seven slender terete rays, the four upper of which are attached to the outer and the three lower to the inner side of the hyoid. At the point where the branchiostegal membranes of opposite sides meet below the throat a median ossification is developed in the subcutaneous tissue; this is the so-called uro-hyal, or basi-branchiostegal (B.Brs).

* Continued from vol. ix. p. 468.

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