

The casual visitor must also enter a protest against the unclean state of the cages of the *Raptorial Birds*, which are splashed all over with ordure, offensive to the sightseer in appearance and smell, and injurious to the health and plumage of the birds themselves.

The drainage of the Zoological Gardens is also so defective as to be verging on a public nuisance to the inhabitants of the banks of the Regent's Canal, so that some means must soon be taken for the better disposal of the sewage.

If facilities do not exist for extending the area of the Regent's Park Gardens, from want of power to acquire more ground, then it should become a serious question whether or not a supplementary Garden might be obtained in the suburbs further off. It could scarcely be expected that the subscribers would relinquish the retention of the present position, on account of its advantageous situation in the town for the access of visitors. It is quite possible visitors might be satisfied with much fewer animals to see, especially of those unattractive in appearance and habits, and it could easily be decreed that all these might be sent to another garden for scientific purposes alone.

Further, the second garden might be appropriated for breeding purposes, and change of air and locality for the usual inhabitants of the old enclosures and dens and cages, when the latter were required to be repaired or disinfected; and finally, it might be used as a sanatorium for the sick, and an asylum for the decrepid and disabled members of the stock, when their further exhibition in public is no longer desirable.

The great prevalence of tubercular and scrofulous diseases reported to exist amongst the animals should also be cited as indicative of a necessity for increased space and ventilation being required in the gardens, and it is much to be desired that some statistics of this class of disorders should be compiled and published for general information, giving details of its greater or less frequency in special classes of quadrupeds, birds, reptiles, and fishes.

VIATOR

It has often occurred to me that the officers in charge of our Zoological Gardens enjoy exceptional opportunities of ascertaining experimentally the limits of the intellectual and educational capabilities of the animals under their charge, but I am not aware of the existence of any systematic effort to realise the harvest of valuable and interesting information that lies here waiting to be gathered. Is not this an object worthy of the attention of the Zoological Society?

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#### NOTE ON THE DEVELOPMENT OF THE COLUMELLA AURIS IN THE AMPHIBIA\*

IN his paper "On the Structure and Development of the Skull of the Common Frog" (Phil. Trans. 1871), Mr. Parker states that, in the fourth stage of the tadpole,† "the hyoid arch has made its second great morphological change; it has coalesced with the mandibular pier in front and with the auditory capsule above (Plate V. Figs. 1-4, and Plate VI. Fig. 8, *s.h.m.*, *i.h.m.*) The upper part, or supra-hyomandibular (*s.h.m.*), is attached to the auditory sac much lower down and more outward than the top of the arch in front. . . . This upper distinct part is small; it answers to only the upper part of the Teleostean hyomandibular; there is a broad sub-bifid upper head answering to the two ichthyic condyles, then a narrow neck, and then behind and below an 'opercular process' (*op.p.*) Below this the two arches are fused together; but the hyoid part is demonstrated just above the commencement of the lower third, by the lunate fossa for the 'styloid condyle' (Plate V. Figs. 2 and 4, *st.h.*)" (pp. 154, 155).

In the sixth stage:—"The supra-hyomandibular (Fig. 3, *s.h.m.*) has become a free plate of cartilage of a trifoliate form" (p. 164).

In the seventh stage:—"The 'supra-hyomandibular' losing all relation to the hyoid arch, becomes now part of

the middle ear. . . . The essential element of the middle ear, the stapes (*st.*), was seen in the fourth stage; the condyles and opercular process of the hyomandibular are now being prepared to form an osseo-cartilaginous chain from the 'membrana tympani' to the stapes. Under these conditions a new nomenclature will be required; and this will be made to depend upon the stapelial relationship of the chain, notwithstanding its different morphological origin.

"I shall now call the lobes of this trifoliate plate of cartilage as follows—namely, the antero-superior 'supra-stapelial,' the postero-superior 'medio-stapelial,' and the freed opercular process 'extra-stapelial' (*s.st.*, *m.st.*, *e.st.*)

"The stapes (*st.*) sends no stalk forwards to meet the new elements, but they grow towards it; this will be seen in the next stage" (pp. 169, 170).

As the question of the origin of the *columella auris* in the *Vertebrata* is one of considerable morphological importance, I have devoted a good deal of time, during the past summer, to the investigation of the development of this structure in the frog, and it is perhaps some evidence of the difficulty of the inquiry, that my conclusions do not accord with those enunciated by Mr. Parker, in the very excellent and laborious memoir which I have cited.

I find, in the first place, that there is no coalescence of the mandibular with the hyoidean arch, the latter merely becoming articulated with the former.

Secondly, Mr. Parker's "supra-hyomandibular" is simply an outgrowth of the mandibular arch from that elbow or angle which it makes, when the pedicle by which it is attached to the trabecula passes into the downwardly and forwardly inclined suspensorial portion of the arch. This outgrowth attaches itself to the periotic capsule, and, coalescing with it, becomes the *otic process*, or "superior crus of the suspensorium" of the adult frog.

The hyoid arch, seen in the fourth stage, elongates, and its proximal end attaches itself to the periotic capsule, in front of the fenestra ovalis and close to the pedicle of the suspensorium, which position it retains throughout life.

The *columella auris* arises as an outgrowth of a cartilaginous nodule, which appears at the anterior and superior part of the fenestra ovalis, in front of and above the stapes, but in immediate contact with it. It is to be found in frogs and toads which have just lost their tails, in which the gape does not extend further back than the posterior margin of the eye, and which have no tympanic cavity, as a short and slender rod which projects but very slightly beyond the level of the stapes, its free end being continued into fibrous tissue, which runs towards the suspensorium, beneath the portio dura, and represents the suspensorio-stapelial ligament of the *Urodela*.

This rod elongates, and its anterior or free end is carried outwards, in proportion as the tympano-eustachian passage is developed. At the same time, the free end becomes elongated at right angles to the direction of the rod, and gives rise to the "extra-stapelial" portion, which is imbedded in the membrana tympani. Ossification takes place around the periphery of the middle of the rod; thus the medio-stapelial is produced. The inner portion becomes the rounded, or pestle-shaped, supra-stapelial, but retains its primitive place and connections, whence we find it in the adult articulated in a fossa in that part of the periotic capsule which forms the front boundary of the fenestra ovalis, but in close contact with the stapes.

The *columella auris* of the frog, therefore, is certainly not formed by the metamorphosis of any part of either the mandibular or the hyoidean arches, such as they exist in the fourth stage of larval development.

It may be said further, that the *columella* undoubtedly seems to be developed from the side walls of the auditory capsule in the same way as the stapes, and some appearances have led me to suspect that it is originally in continuity with the stapes, but I am not quite sure that such is the case. Are we to conclude, therefore, that the *columella*

\* Read at the meeting of the British Association at Belfast, August 25, 1874, by Prof. T. H. Huxley, F.R.S.

† That is, when there is a branchial aperture only on the left side, and the hind limbs are rudimentary or very small.