LIX. Additional memoir upon living and fossil elephants

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nearly healed ; from this time the cure went on gradually, and was completed in about a week.

In this hernia, the external swelling was but small, the sac being situated between the two abdominal rings ; it receded easily under the edge of the transversalis muscle by external pressure, a circumstance not sufficiently explained in surgical authors, nor known by surgeons in general. A fatal mistake of this kind came within my knowledge but a short time since, in a patient who would willingly have submitted to the operation, but a surgeon persisted in his capability of reducing the hernia, because he found it to recede by external pressure : the patient died in a few days : dissection proved the fallacy of his judgment.

JOHN TAUNTON,

Surgeon to the City and Finsbury
Dispensaries, Lecturer on Ana-
tomy, Surgery, Physiology, &c.

Greville-street, Hatton-garden,
Sept. 21, 1807.

Subscriptions and donations for the City Truss Society for affording relief to the ruptured poor, by supplying them with trusses free of expense, are received by James Amos, esq. Devonshire-square, Bishopsgate ; Mr. Alexander Maxwell, 331, Strand ; Mr. Elliott, City Dispensary ; Mr. Bartlett, Finsbury Dispensary ; and by Mr. Taunton, where plans may also be had.

LIX. *Additional Memoir upon living and fossil Elephants.*

By M. CUVIER.

[Continued from p. 264.]

WHEN all the parts of the body of the tooth are made and consolidated, and when it comes to emerge from its alveolus, it undergoes changes of a new description.

As the elephant is herbivorous, its teeth are worn down by mastication, like those of all the animals who live upon similar food. We even know, that it is necessary that their teeth should be worn before their surfaces are in a fit state

for chewing vegetable substances. This general fact, still more clearly brought to light by the labours of M. Tenon, proved to him of itself, and independently of all those which we are about to develop, that teeth are not organised in the same manner with bones. We all know to what accidents these last are exposed, when they are cut or merely laid bare.

The summits of the small notches of the laminæ will be first worn :—when once worn down to the interior substance, each of these summits will present a circular or oval disk of that substance, surrounded by a circle of enamel and a circle of cortical ; and there will be a range of these small circles by each lamina.

If the detrition penetrates to the bottom of the hollows which produce the notches, all these small circles will be united into one single stripe of osseous substance, surrounded by a double line of enamel, and the cortical substance will make the whole tour of the tablet of the tooth, and will occupy all the intervals of the stripes. Each stripe will be the section of one of the transversal laminæ which compose the tooth.

And if the detrition could go the length of the place where the laminæ all join into a single corona, the entire tooth will no longer present any thing else than a very large disk of osseous substance, surrounded on every side by a small edge of enamel and another of cortical.

But the detrition can never go so far, because it never takes effect at the same time upon the whole corona, as the consolidation has not taken place there, and for the following reason :

The tooth, in consequence of its rhomboidal form, and from its very oblique position, presents its anterior part much sooner in mastication than it does its posterior part. The plane or tablet produced by mastication therefore forms, with the common surface of the summits of all the laminæ, an angle open behind ; and from this it happens, that, when the front laminæ are cut deeply, and form entire stripes, the intermediate laminæ do not as yet present any thing else than transverse rows of circles or ovals, and those behind
are

are completely untouched, and present the summits of their notches in the shape of nipples.

The anterior laminæ are also completely destroyed before the posterior ones are strongly cut in front; and from this there follows another phænomenon, also peculiar to elephants; their teeth diminish in length at the same time that they diminish in height.

While the exterior part of the tooth is wearing down and diminishing, the portion of the root which corresponds to it is worn in another manner, which is more difficult to conceive. On examining what remains of it, we find it as it were pared down; it presents at its surface small irregular cavities, as if it had been dissolved by an acid thrown upon it drop by drop. It is a kind of caries similar to that undergone by the human teeth when stripped of their enamel. We shall investigate the cause of this presently. It always happens that the tooth is by this means successively deprived, in the various portions of its length, of segments or trenches which occupy the whole height of it.

Thence also results another singular effect: the anterior part of the jaw being always to be filled up, the tooth moves from behind to the front horizontally, while it moves vertically from top to bottom, or *vice versa*, according as it belongs to the upper or lower jaw.

This is the reason why every tooth, at the time of its falling, is very small, however large it may have been previously.

This movement of the tooth makes room for that which is formed in the back jaw, and which must succeed it; this second tooth assists by its development in pushing the first forward; and we may say that the large teeth of the elephant come behind its young teeth, in place of coming above or under, as in other animals.

Patrick Blair*, who had seen separate transverse laminæ in the back jaws of the elephant, and who had named them very justly *rudiments of teeth*, was unwilling to believe that these laminæ afterwards proceeded to form a tooth which

* Phil. Trans. vol. xxvii. no. 326. p. 116.

would replace the one behind which he found these laminæ. He was therefore reduced to the necessity of searching for various imaginary uses of them.

Disputes were maintained as to the number of the teeth of the elephant: the Royal Society of London perceived, in 1715, that it varies from one to two on each side, and that the place of the division varies also; that is, the first tooth is longer or shorter, in proportion to the second, according to the individuals*. Pallas was the first who taught the mode of their succession, which explains all these irregularities, by showing that at first they have only a single tooth on each side; that the second, in developing itself, pushes the former in such a manner that during a certain time there are two of them; afterwards the fall of the first leaves one only†.

I have announced that this succession, and consequently this alternate change in number, was repeated more than once, because I had also found separate germs in an elephant which had already two teeth in their places‡. This last point had been already established, but with respect to the upper jaws only, by Daubenton§; in short, this great naturalist had also presented to a certain degree the necessity of this succession from back to front, which Pallas has more clearly developed.

Mr. Corse|| has informed us that this succession is repeated so often as eight times in the Indian elephant; that there are consequently thirty-two teeth which successively occupy the different parts of its jaws.

The first appear eight or ten days after birth; they are well formed in six weeks, and completely cut in three months. The second are well cut at two years of age. The third appear at this period, and make the second fall out at six years; these are, in their turns, pushed out by the fourth at nine years. The subsequent periods are not so well known.

For my part, I never found more or less than three teeth at once in the two elephants I dissected, and in five dry ske-

* Phil. Trans. vol. xxix. no. 349. p. 370.

† Nov. Com. Petrop. xiii.

‡ Memoires de l'Institut, Sciences Math. tom. ii.

§ Hist. Nat. tom. xi. in 4to.

|| Phil. Trans. 1799.

leton heads which I examined, viz. a small grinder more or less ready to fall ; a tooth in its place, and full grown ; and a germ more or less large, more or less consolidated, and occupying the whole bottom of the back jaw.

We may easily judge, from the depth of the detrition, whether a tooth which has been found isolated, was situated before or behind in the jaw ; those which were situated in front never have any of their laminæ entire.

The number of the laminæ which compose each tooth go on augmenting in such a manner, that each tooth has more laminæ than that which immediately preceded it.

Mr. Corse, who first made this remark, gives these numbers from his own observations * : the first have four laminæ only ; the second, eight or nine ; the third, twelve or thirteen ; and so on to the seventh or eighth, which have 22 or 23 laminæ. Mr. Corse never saw any teeth which had more.

We have reason to believe that these numbers are not very constant ; for we have a lower jaw, the first tooth of which has 14 laminæ, and the subsequent one has fourteen germs of laminæ. M. Camper has one completely similar (*Descrip. Anat. d'un Eleph. Plate XIX. fig. 2.*) ; but in the upper jaw, which corresponds to ours, there are in the full grown tooth thirteen laminæ, and in the germ of the subsequent one there are eighteen.

Independently of the number, there are deficiencies with respect to the thickness of the laminæ ; they are thinner in the first teeth than in the last : and as the jaws are shorter when they bear the first teeth, it happens that the number of the laminæ in activity is nearly the same at all times ; *i. e.* from 10 to 12.

When the elephant is full grown the space occupied by the laminæ in activity, is larger, it is true ; but these laminæ are themselves larger, and always fill the space whatever it may be.

As it requires nearly the same time to wear down the same number of laminæ, the last teeth, which have much more

* *Phil. Trans. ut supra.*

of them, last much longer than the first. The substitutions therefore take place at intervals longer and longer as the elephant advances in age.

The teeth of elephants, like those of all other animals, only push out their roots when the body is perfect; the roots are formed in layers like the rest of the tooth: it could not well be otherwise. But why this division in another sense, when the junction of the caps of all the gelatinous eminences seems to produce nothing else than a single body?

In order to answer this question, which is of a general interest to all kinds of teeth, we must add a circumstance to the description I have given of the genus: I have reserved this point until the present occasion, that I might not too much confuse the ideas of my readers.

The base of this gelatinous body, whose productions, which I have called *walls*, serve as nuclei to the laminæ of the tooth, does not adhere at all its points to the bottom of the capsule. There are, from space to space, interruptions of the continuity, and consequently the adherent parts of this base may be considered as very short pedicles. When the laminæ of osseous substance cover all the productions or walls, and all the body of the nucleus of the tooth, it is continued always upon and between the pedicles: the particles of this lamina which proceed between the pedicles form the under part of the body of the tooth; the particles which envelop the pedicles, and which are consequently more or less tubulous, form the first commencements of the roots.

These roots, and the pedicles which serve them as a nucleus, are afterwards lengthened, for two reasons: at first, the progress of the laminæ of osseous substance, which, by always shooting, force the tooth to rise and leave the alveolus; afterwards, the thickening of the body of the tooth by the formation of the successive layers, which, by filling the interior vacuum, hardly leaves any more room for the gelatinous nucleus, and pushes it towards the interior of the tubes of the roots.

There is no enamel nor cortical produced upon the roots,
because

because the internal lamina of the capsule, which has alone the power to secrete these two substances, does not extend so far.

I am of opinion that it is partly to this absence of enamel that the corrosion is owing, which begins upon the roots as soon as the portion of the corona corresponding to them is worn down their length.

At this period the root has assumed all the development of which it is capable; the pulpy nucleus is entirely repelled by the layers with which it has itself filled the cavity it occupied. This force of increasing of the root ceases therefore to counterbalance the increase of the osseous partitions of the alveolus, and the latter continually push the root outwards. It begins to rot as soon as, when showing itself out of the gum, it is exposed to the septic action of the air, the heat and humidity of the mouth.

What, in my opinion, adds some probability to this idea is, that the corrosion begins rather at the junction of the root and the corona than at the point of the root. I have several proofs of this in my specimens. We may also judge of it from the small tooth represented by Mr. Corse. (Phil. Trans. 1799, Pl. VI. fig. 3.) Perhaps also the mechanical compression which the root experiences from the alveolus contributes to its destruction, as we attribute the destruction of the roots of the young teeth to the compression they receive by the shrinking of their alveolus, occasioned by the development of the teeth which must succeed them.

To conclude, one part of their molecules must be organically absorbed; but this would not be the only phenomenon in which a body, become foreign, is sucked up by the lymphatics, and disappears. The fact is known with respect to liquids. As for solids, I think we have examples of it in some remote instances. We may consult on this head the dissertation by Alexander Macdonald.

The teeth of the two jaws of the elephant are easily distinguished by their form. Those of the upper jaw have their laminæ disposed in such a manner, that all their summits are in a convex surface. The tablet produced by their
detrition

detrition is also convex. The contrary is the case, in these two respects, with the lower jaw.

A still more striking character may be inferred from the direction of the laminæ, with respect to the corona on the triturating part.

Those from below are inclined backwards; that is to say, the acute angle they form with the plane of trituration is directed forward, at least in their radical part; for the summits of the anterior laminæ are bent a little backward.

Those from above, on the contrary, are inclined forward, or the acute angle they form with the plane of trituration is directed backward.

It is always easy to distinguish the back of the tooth from the front: the trituration cutting much more forward than backward, it is the end the most deeply worn down of the corona, which is always the anterior.

It must be remarked, however, that the inclination of the laminæ upon the corona diminishes at the two jaws in proportion as the detrition increases. The posterior laminæ, which are not so slowly worn down, are now worn a little faster, because, their development towards the root continuing when that of the anterior laminæ has ceased, they are pushed outwards with more force: whence it happens that the tablet of detrition becomes more and more perpendicular to the direction of the laminæ.

We also distinguish the teeth belonging to each side, because they are convex to their internal face, and a little concave to the external one.

[To be continued.]

LX. *Proceedings of Learned Societies.*

FRENCH NATIONAL INSTITUTE.

[Continued from p. 284.]

M. DE BEAUVOIS entertains similar ideas upon the impregnation of mushrooms.

Various parts of these plants, like the laminæ of the agarics,