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EXPLANATION OF PLATE III.

(All the figures are of the natural size.)

Fig. 1. Portion of lower jaw with the three true molars, *m* 1, *m* 2, *m* 3, from the outside.

Fig. 2. Crowns of the same teeth, from the inside.

Fig. 3. Grinding surface of the same teeth: *f*, outer cusp or division of the lobes of the first true molar; *a, b, c, d, e*, the five internal accessory basal cusps of the internal divisions of the same tooth; *f′, f″*, the outer divisions of the two anterior lobes of the last molar; *g*, the outer division of the third lobe of the same tooth.

This specimen is from the Upper Eocene clay of the Isle of Wight, in the collection of Dr. Wright of Cheltenham.

Fig. 4. Part of the upper jaw, showing the working surface of the right incisors, canine, and three anterior premolars, as in their natural position.

4 *a*. Outside view of the third premolar of the same specimen.

Fig. 5. Portion of lower jaw, with the last true molar.

5 *a*. Grinding surface of the same molar.

These specimens are from the Upper Eocene sands of Hordwell, Hants, and are in the British Museum.

2. *On the* Fossil Vertebræ *of a* Serpent (Laophis crotaloïdes, Ow.) *discovered by* Capt. Spratt, R.N., *in a* Tertiary Formation *at* Salonica*. By Prof. Owen, F.R.S., F.G.S. &c.

[Plate IV.]

The characters for distinguishing and determining the fossil remains of Serpents are deemed, I believe, by most palæontologists to be less salient and satisfactory than in those of other reptiles. I have found, however, in the course of comparisons called for by the discovery of Ophidiolites in our own tertiary strata, more differentiating characters in Ophidian vertebræ than the works on comparative anatomy gave promise of; and no palæontologist would find a difficulty in distinguishing the vertebra of an eocene *Palæophis* (Pl. IV. fig. 1), *e. g.* from that of any known existing Ophidian, provided the neural arch (*n, z*) were entire.

For the nomenclature of the parts and processes of an Ophidian vertebra, and for their chief modifications in existing Serpents, I must refer to my "History of British Fossil Reptiles†," pp. 135–139, *Ophidia*, plates 2 and 3. It will there be seen that in the genera *Python* (figs. 5 and 6), *Boa, Eryx, Coluber* (fig. 7), *Deirodon*, and *Hydrus*, the hypapophysis (*h*) subsides into a ridge, or a short subcompressed tubercle, in the vertebræ situated behind the anterior third or fourth part of the trunk; but that in *Crotalus* (fig. 4), *Vipera*, and *Natrix* the hypapophysis, *h*, is continued, with more or less diminution of relative length, from all the vertebræ supporting free ribs.

In all the fossil vertebræ of the Serpent from Salonica, thirteen in number, submitted to my examination, the hypapophysis (figs. 2 and 3, *h*), where entire, is developed, of equal length and similar form,

* See above, p. 183.

† See also Monograph of the Eocene Reptiles, Palæont. Soc. 1850, plates 13 and 14.

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from the back part of the under surface of the centrum, and a ridge is continued from the fore-part of its base, gradually expanding as it subsides, to the lower rim of the anterior articular cup of the centrum, below which it makes no projection.

With the small number of vertebræ of this fossil Serpent transmitted for comparison, this character alone will not warrant a conclusion in favour of its affinities to the *Crotalus*, since they may all have come from the anterior region of the trunk, where a similar hypapophysis is developed in the other genera of Serpents above mentioned.

In point of size, the vertebræ from Salonica agree with the middle trunk-vertebræ of a *Python tigris* of 11 feet in length; but they are manifestly of a different genus and family of Serpents.

Independently of the ridge continued forwards from the hypapophysis, there is a process, figs. 2 and 3, *d'*, flattened behind, produced downwards and forwards below and beyond the articular cup, from the under part of the diapophysis, *d*, as in *Crotalus*, fig. 4. A small and well-defined articular tubercle, *d*, projects from near the upper part of the diapophysial surface, also as in *Crotalus*; and the upper part of the diapophysis is produced and bent outwards at *d''*, beneath the anterior zygapophysis, *z*, with which it is blended, and which it seems to sustain, like a cantilever in roof-architecture; the obtuse point of the process extending outwards (fig. 3, *d''*), about a line beyond the flat articular surface of the zygapophysis, *z*. A minute tubercle beneath the outer end of that articular surface indicates the homologous point in *Python*; but the production of the pointed process is not found in any of the vertebræ of the constricting Serpents. It characterizes the vertebræ of the genera *Coluber* (fig. 7), *Naja*, *Crotalus*, and *Hydrus*; and the degree to which the process in question is produced in the fossil Serpent is intermediate between *Coluber*, where it is longest, and *Crotalus*, where it is less developed.

The zygosphene, *zs*, is relatively broader in proportion to its depth in the fossil Serpent (fig. 3) than in *Python* (fig. 6), and is slightly excavated anteriorly, and without a median tubercle; it more resembles the form and proportions of that part in *Coluber* and *Crotalus*. The posterior border of the neural arch, *n*, describes a gentle curve convex backwards as it descends from the base of the neural spine to the posterior zygapophysis, *z'*. The similarly-sized fossil vertebræ of the *Palæophis toliapicus* offer a striking contrast with the Salonica Ophidiolite in the configuration of this part, which is produced into an angle (fig. 1, *n*); the posterior zygapophyses are more produced outwards than in the anterior trunk-vertebræ of *Python*, resembling those of the middle trunk-vertebræ of *Python*, which are without the long hypapophysis. The base of the neural spine is coextensive with the neural arch; no well-defined part of the zygosphene projects beyond it, as in *Python*, *Naja*, and *Hydrus*. In this respect the Salonica Ophidiolite resembles *Crotalus*; the neural spine is more compressed than in *Python*, and its posterior border slopes more backward; but it is not sufficiently entire in any of the specimens to permit this comparison to be pursued with advantage. The process from above the concave part of the expanded articular

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end of the rib is relatively longer than in *Python*, resembling in its proportions that in *Coluber*; and the articular concavity itself is better defined.

Of the 253 trunk-vertebræ of the *Python tigris*, the 74 anterior ones have long hypapophyses; the remaining 179 have mere tubercles in the place of those processes. If 13 scattered vertebræ of a disarticulated skeleton of such a Serpent were picked up, it is three to one but that they would be of the 179 without the hypapophyses.

In the *Coluber Histrio*, the 58 anterior vertebræ have hypapophyses; the succeeding 157 vertebræ, which support moveable ribs, have no hypapophyses. In the *Deirodon* (*Anodon*) *scaber*, hypapophyses are developed from 32 anterior vertebræ; in the remaining 58 vertebræ with moveable ribs the process subsides to a mere tubercle. In the same proportion of the trunk-vertebræ of an African species of *Eryx*, the hinder end of the hypapophysial ridge is slightly produced. In *Naja*, as in *Viperus*, the hypapophysis is continued, but of relatively smaller size than in *Crotalus*, from the posterior part of the lower ridge of the vertebra throughout the trunk. The diapophysis presents the same well-marked tubercle upon its upper part as in the Rattlesnake, but the lower end is less produced; the process underpropping the zygapophysis projects proportionally further beyond the articular surface.

The probability is in favour of the fossil Serpent from Salonica resembling those genera in which the hypapophysis is well developed from all the trunk-vertebræ; the breadth of the base of the neural arch indicates that they have been from about the middle, not from the fore-part of the trunk. The vertebræ offer so many points of resemblance with those of the Rattlesnake and Viper, that they may have belonged to a venomous species; they are, however, at least, specifically distinct from the vertebræ of known species of *Crotalus* and *Vipera*, and they by no means afford certain grounds for a conclusion as to the poisonous character of the Salonica Serpent.

The known existing Serpents of Southern Europe and Asia Minor include a species of *Eryx* (*Anguis jaculus* of Hasselquist), several subgenera of Colubrine harmless Snakes, e. g. *Ailurophis vivax*, Fitzinger, *Cœlopeltis monspessulana*, Ranz., *Periops hippocrepis*, Wagler, *Zacholus austriacus*, Wagler, *Zamenis Riccioli*, Bonaparte, *Callopeltis flavescens* and *Cal. leopardinus*, Fitz., *Rhinechis scalaris*, Bonap., *Elaphis quadrilineatus*, Bonap., *Hæmorrhoïs trabalis*, Boie, also from four to six species of *Natrix* and of *Coluber* proper; but none of these species now present a size comparable with that of the fossil Serpent from Salonica. Some individuals of the *Natrix viperina* of Dalmatia have been said to reach the length of 6 feet. The poisonous Serpents of the South of Europe and Western Asia are exclusively viperine (*Pelias berus*, Merrem, *Vipera aspis*, and *Vip. ammodytes*, Latr.), but are still smaller in comparison with the fossil.

The classical myth embalmed in the verse of Virgil, and embodied in the marble of the Laocoon, would indicate a familiarity with the idea at least of Serpents as large as the *Laophis* in the minds of the

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ancient colonists of Greece. But according to actual knowledge, and any positive records of zoology, the Serpent, between 10 and 12 feet in length, from the tertiary deposits of Salonica, must be deemed an extinct species. The fossil may be provisionally indicated as *Laophis crotaloïdes**.

EXPLANATION OF PLATE IV.

Fig. 1. Middle trunk-vertebra of *Palæophis typhœus*, Ow., from the Eocene of Bracklesham, Sussex.
2. Trunk-vertebra of *Laophis crotaloïdes*, Ow., from near the Promontory of Karabournou, on the eastern coast of the Gulf of Salonica.
3. Front view of the same vertebra.
4. Two middle trunk-vertebræ of *Crotalus durissus*.
5. Middle trunk-vertebra of a *Python tigris* 17 feet long.
6. Front view of the same vertebra.
7. Middle trunk-vertebra of the *Coluber Histrio*.

(All the figures are of the natural size.)

c. Anterior articular cup.
o. Posterior articular ball.
h. Hypapophysis.
d. Diapophysis with articular convexity for the rib.
d′. Lower diapophysial process.
d″. Upper diapophysial process.
z. Anterior zygapophysis.
z′. Posterior zygapophysis.
zs. Zygosphene.
n. Hinder border of neural arch.
ns. Neural spine.

3. *On* Annelide-burrows *and* Surface-markings *from the* Cambrian Rocks *of the* Longmynd†. No. 2. By J. W. Salter, Esq., F.G.S., and of the Geological Survey.

[Plate V.]

In a former communication (March 1856) I described a few obscure traces of animals from these old rocks in the Longmynd, and have now to add some further information, gathered during the last summer in the same locality.

The markings which were in that paper referred to the burrows of Annelides have been found in the greatest profusion, and through a much greater thickness of strata than before, not less than a mile in vertical measure; and they have been detected too in places considerably to the south and west of the localities before given.

I am glad of the opportunity of again drawing attention to the subject, partly because the woodcut-section in the former paper, at page 247, Journ. No. 47, was accidentally made so as to exclude the most important beds, and partly because these annelide-markings have, during the present year, been sedulously searched for, and similar ones found, by my friend, Dr. J. R. Kinahan, of Dublin, in the undoubted Cambrian beds of Bray Head, Wicklow. His paper

* Gr. λᾶας, a stone, ὄφις, a serpent.

† For the former communication on Fossil Remains in the Cambrian rocks of the Longmynd, see Quart. Journ. Geol. Soc. vol. xii. p. 246.

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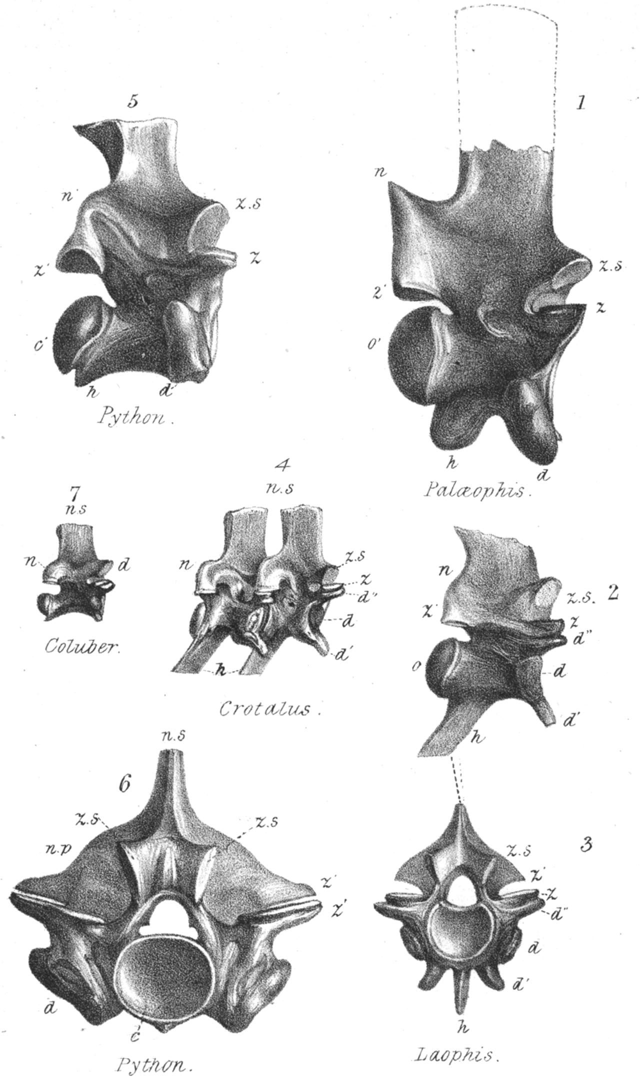

R. Owen, del. On Stone by J. Erxleben.   Day & Son, Lithrs to The Queen.

RECENT & FOSSIL OPHIDIAN VERTEBRÆ