XXIII. *Description of some Remains of the Gigantic Land-Lizard* (Megalania prisca, OWEN), *from Australia.*—Part II.

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[PLATES 34–38.]

IN a former Part[*] the author submitted to the Royal Society evidences of the above Lacertian species, a contemporary in Australia with correspondingly large Marsupial Mammals, and which, with them, had become extinct. The remains of their cold-blooded associate, received in 1858, consisted of mutilated vertebræ. They had been imbedded in drift-deposits more or less compacted, which, when traversed by streams, had become broken up by the violence of the course to which Australian rivers are subject. During the alternate periods of drought, the river-beds are laid bare, and under these conditions the remains of *Megalania* already, and about to be, described, have been exclusively found. I have not received any specimen referable to the genus from the breccia-clefts and cave-deposits of Australia.

Although the materials for restoration of the subject of the present and former papers are incomplete, especially in regard to the limbs, I am unwilling longer to defer communicating the results of study of such portions of the skeleton as have come into my hands during the last twenty years.

The most common examples have been parts of the trunk, and among these was one entire dorsal vertebra,[†] of which figures are subjoined (Plate 34) of the natural size.

This bone somewhat exceeds the largest of those previously described,[‡] as the subjoined dimensions indicate:—

	1858.		1880.	
	inches.	lines.	inches.	lines.
Length of centrum	3	3	3	6
,, non-articular lower surface of centrum . .	2	0	2	2
Breadth of centrum	1	11	2	0
Vertical diameter to highest part of neural arch . .	3	4	3	9
,, including neural spine.			5	9

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[*] Phil. Trans., Vol. 149, 1858, p. 43.

[†] Transmitted by Dr. GEORGE BENNETT, F.L.S., from Darling Downs, Queensland.

[‡] *Loc. cit.*, Plate 7, figs. 1–4.

The following differences, though of minor import, may be noted. The anterior (articular concave) surface of the centrum has not the "shallow transversely lengthened pit at the centre":[*] the two very shallow depressions at the fore part of the under surface are less marked. Better defined is the pair of tubercles above the entry of the neural canal (Plate 34, fig. 2, *n*). The neural spine (*ns*) is entire: the ridge dividing the upper surface of the neural arch is continued into the sharp anterior border of the spine; this abruptly gains breadth towards its hinder part, which is traversed by an obtuse medial rising; but this, as it descends, narrows, and is continued below the root of the spine into a sharp ridge above the exit of the neural canal, dividing there the interspace between the post-zygapophyses, as the anterior ridge (*r*) does that part of the roof of the neural arch.

The spine (*ns*) of the vertebra (ib., figs. 1 and 2), which is probably from the middle of the back, is 2 inches 6 lines in length anteriorly, 2 inches posteriorly. Here the base is broadened by a pair of obtuse ridges continued from the upper part of the post-zygapophyses (*z′*) contracting as they rise, and finally subsiding upon the broader part of the spine. The antero-posterior diameter of the spine is the same throughout: the summit is truncate and is formed by a partially coalesced epiphysis. The extreme contraction of the outlets of the neural canal, noted in the former Part,[†] is more striking in the present large vertebra, especially that of the anterior one (ib., fig. 2, *n*), of which the vertical diameter does not exceed 3 lines.

The chief difference presented by the dorsal vertebræ of *Moloch horridus*, which for reasons subsequently given is here contrasted with corresponding vertebræ of *Megalania prisca*, besides that of general size, is the greater relative capacity of the neural canal (ib., fig. 4).

In the sacral vertebræ of *Megalania*[‡] (Plate 35, figs. 1 and 2) the neural canal (*n*) is enlarged in relation to the part of the myelon which was connected with the nerves of the hinder limbs, and I infer the possession of these in proportions at least equal to those in *Moloch* from this character. Although the vertical diameter of the anterior concavity of the centrum is reduced to 1 inch 2 lines, that of the neural canal is increased to 5 lines; and at the opposite end to 6 lines: the transverse diameter of each outlet being 11 lines. The sacral centrum gains in breadth, while losing in height: the two diameters of the anterior cup (*c*) are, respectively, 2 inches 4 lines and 1 inch 3 lines. The under surface of the centrum (ib., fig. 2) is flattened, with a feeble transverse concavity along its medial third. The length of the centrum is 2 inches 2 lines; the breadth behind the base of the "transverse process" is 2 inches 6 lines. This process (*p*), combining par- and di-apophyses, extends its base over the fore half of the coalesced centrum and neural arch. It, probably, extended outward, by the addition of a coalesced costal element, to the degree shown in the sacral vertebræ of *Moloch* (ib., fig. 5, *d*) and most other Land-Lizards; it has been broken

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[*] Ibid., p. 44.

[†] *Loc. cit.*, p. 45.

[‡] Transmitted by F. M. RAYNAL, Esq., M.R.C.S., from the neighbourhood of Melbourne, Victoria, 1862.

away on both sides in the Megalanian specimen described. The post-zygapophyses are relatively small and narrow. The medial ridge upon the neural arch rises at once to contribute to the neural spine, which accordingly has greater basal breadth than in the antecedent vertebræ. This, with other characters, are repeated, in miniature, by the sacral vertebræ of *Moloch horridus.*

The caudal vertebræ of *Megalania** are represented in my present collection by a single specimen (Plate 35, figs. 3 and 4) from about the middle of the tail. In it the ordinary proportions of the cup and ball are resumed, with minor flattening of the centrum: but the terminal articular surfaces are less oblique, the lower border of the cup (*c*) being more produced and the corresponding part of the ball (*b*) encroaching more upon the under surface of the centrum. The transverse process (*d*) springs from the side of the vertebra further and more distinctly from the pre-zygapophysis (*z*) than in the trunk-vertebræ: with the spinous process it is broken away, but is depressed in shape as far as preserved. A pair of hypapophyses (ib., fig. 4, *h*) rise, with an interspace of 3 lines, from the under surface of the centrum, near the ball (*b*): a smooth surface on one of them indicates the hæmal arch and spine to have been movably articulated, not anchylosed as in *Moloch* (ib., fig. 6, *hs*), to these processes. The length of the centrum of the described vertebra of *Megalania* is 2 inches 1 line; the breadth of the neural arch is 2 inches 8 lines.

The occipital segment of the skull of *Megalania* (Plate 36, figs. 1 and 2,)† shows, as in most mature Lizards, confluence of its constituent parts or "elements."

The centrum ("basioccipital," ib., fig. 1, 1) convex posteriorly, as in the following vertebræ, forms the lower half of the occipital condyle, the upper portions being contributed by the bases of the neurapophyses ("exoccipitals," ib., 1, 2). The original sutures between these and the centrum are indicated by slight linear depressions. The condyle is crescentic in shape and projects wholly behind or beyond the neural arch; the upper surface of the centrum in advance of the condyle shows a transverse excavation. The breadth of the condyle is 1 inch 9 lines; the medial depth is 9 lines.

The neural canal ("foramen magnum," ib., *n*), the side walls of which are due to the exoccipitals, (2,′ 2′), is completed in its upper third by the base of the neural spine (superoccipital, ib., 3); slight linear impressions indicate the original junctions of the latter with the exoccipitals. The outlet of the neural or cerebral canal (*n*) is subcircular, 1 inch 3 lines in diameter, but as it advances it contracts to a diameter of 1 inch, and this is encroached upon by the lateral ridges (ib., fig. 2, *n′*).

About three inches extent of the base of the skull is preserved in advance of the occipital condyle; it is formed by the coalesced basioccipital and basisphenoid. The basioccipital curves down at its mid-part and extends laterally, with a similar curve, to form the parapophyses which, beyond the outlets of the vagal nerves, coalesce with

* Collected by M. St. Jean, at Gowrie, near Drayton, Darling Downs, Queensland, 1866; presented by Sir Daniel Cooper, Bart., K.C.M.G.

† From the same locality as the "caudal vertebra," and received at the same date.

the diapophyses or "paroccipitals" to form strong triedral costal processes, more or less broken away, in the fossil (ib., figs. 1 and 2, 4). The lower surface of the basi-occipital is transversely convex at the middle part, concave on each side.

The basisphenoid develops laterally a pair of hypapophyses in the form of low tuberosities, for the attachment of strong "recti capitis" muscles; on the left side the process shows a second pointed prominence. In advance of these are the bases of larger outstanding processes against which the pterygoids abut, in *Moloch* and other Lizards; these processes (ib., fig. 2, 5′, 5′) answer to the pterapophyses in the basisphenoid of Birds. At the anterior interspace of the above processes is the small surface (ib., fig. 2, 9)—here fractured—from which the presphenoidal rostrum was continued. Above the base of this process is the "sella turcica" (ib., fig. 2, 5), into which open a pair of vascular canals. The sides of the "sella" are produced into a pair of sub-compressed processes, as in *Iguana* (ib., fig. 4, 5). *Megalania* here differs, mainly, in the deeper excavation of the sella and the closer approximation of the vascular (entocarotid) canals.

The next difference is shown by the non-articular termination of the pre-zygapophyses (ib., figs. 1 and 2, 5′, 5) of the occipital vertebra, and also of its spinous process (ib., *ns*), which ends obtusely and freely, like the neural spine of a trunk-vertebra.

The post-zygapophyses are those which are applied and anchylosed to the long and strong substrihedral paroccipitals (ib. 4), extending outward and backward from the sides of the centrum and neural arch of the occipital segment. The part extending from the sides of the centrum is much less than that from the neurapophyses, from which it is divided by the nerves issuing from the vagal foramina (ib., fig. 1, *v*, *v*), which pierce the base of the neural arch obliquely from within, outward, and backward, thus indicating the par- and di-apophysial constituents of the strong occipital transverse processes.

In the trunk-vertebræ of *Megalania* the neurapophyses, as they rise to form the side walls of the neural canal, develop, as has been shown (Phil. Trans., 1858, p. 44, Plate 7, fig. 4, *n*), a ridge projecting inwardly from their medial surface about half way between the floor and roof of the canal, the ridge beginning in advance of the hinder outlet. The exoccipitals repeat this neurapophysial character, but the encroaching ridges have greater basal extent and terminate obtusely, converting the anterior outlet of the occipital vertebra (Plate 36, fig 2, *n′*) from a circular to a triangular or triradiate figure. The anterior outlet of the occipital neural ("epencephalic") canal is similarly modified in *Iguana*, but with a minor prominence of the inner side-surface of the neurapophyses. Accordingly, the triradiate form of the front outlet is more marked in *Megalania*, and both vertical and transverse dimensions are relatively less than in *Iguana*, still less than in the more diminutive *Moloch* (ib. fig. 5).

The more instructive part of the skull in advance of the occipital segment, in relation to the Lacertian affinities of *Megalania*, has come to hand in the present year.

I was favoured by receiving from GEORGE FRED. BENNETT, Esq., Corr. Member of the Zoological Society of London, a letter of November 27th, 1879, in which he writes :—" You will be pleased to hear of a new discovery which my father received on November 16th. I got it in King's Creek, part of Clifton Run, of which my father speaks in a letter to me, as follows :—' On examining the fossil skull you sent I considered it Reptilian, and at first sight to be a Turtle; but on further inspection there are some points which are against that opinion. There is, at present, some difficulty in solving the question. Therefore, try to get, if possible, the lower jaw and other portions of the animal, so that it may be as perfect as possible to make a drawing or cast of it before sending it to Professor OWEN.' "

In reference to the parts which I have received, Mr. G. F. BENNETT writes :—" The whole lot was got in such a mixed way that it is hard to divide them. The letters R for 'Reptilian' and D for 'Diprotodon,' in the sketch, will give you an idea of it. They were excavated in a very hard red drift and had to be dug out with a pick: close to them was a very large jaw of *Diprotodon*. It is my intention to work out the whole of this bank. The horns were apparently in front as if they were originally in front of the eyes, but came away when digging; but I found they were not joined together to the other part of the skull."

In a letter from the father, my old and esteemed friend Dr. GEORGE BENNETT, F.L.S., of December 20th, 1879, he announced the transmission of this collection, and inclosed photographs of ten of the larger portions of the supposed Reptilian skull.

They included unquestionable horn-cores and the fore part of an upper jaw, showing no trace of teeth or sockets on the alveolar border. Such correlation of horns with edentulous premaxillaries might well suggest the co-existence of a large herbivorous Mammal, which, if Marsupial, would be much nearer akin to the placental Ruminants than are the Kangaroos. But the edentulous border showed unequivocal evidences of having been encased, like that of a Chelonian, with horn, as my friend at first sight surmised: yet in a fashion more like that of the terrestrial plant-eating Tortoises* than of the fucivorous Turtles.†

On restoring the cranium as far as its transmitted fragments could be correctly juxtaposed, it manifested, in one part, not only a well-defined surface from which an apparently autogenous horn-core, as in the Giraffe, had become detached, but also pairs of exogenous ones like those of the Ox. The longest of these extended from the upper and side borders of the hinder portion of the cranial specimen, but evidently anterior, as in the Bison, to the occipital ridge. The surface, seemingly, for the sutural attachment of a horn-core was on the upper part of the nasal bone, symmetrical in shape, crossing the mid-line like the horn of a Rhinoceros.

The breadth of this many-horned skull from tip to tip of the pair of horn-cores (Plate 37, fig. 1, *b*, *b'*) is 1 foot 10½ inches: the length of the recomposed extent,

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* CUVIER, 'Ossemens Fossiles,' 4to., tom. v, pt. 2, plate 11, fig. 19, *a*, *b*.

† *Tom. cit.*, plate 11, fig. 3, *e*, *e*.

including the natural anterior end of the skull (Plate 38, fig. 1) is 1 foot; but the occiput, here, is wanting.

The length of each of the horn-cores (*b*, *b′*) is 5 inches: the circumference of the base of the core is $8\frac{3}{4}$ inches: this is of a full oval shape, 3 inches across antero-posteriorly, 2 inches vertically. These cores are conical, nearly straight; the upper contour is slightly concave lengthwise near the base and also at the apex, but runs straight between them; the lower contour is very slightly but uniformly convex. It may be inferred that the horny sheath (*b′*) of the core showed a more definite, though feeble upward curve. Both cores extend almost horizontally outward, transversely to the long axis of the skull. Their surface is impressed by small vascular holes and channels.

A second shorter core (Plates 37 and 38, fig. 1, *e*), projecting from the fore part of the base of the preceding, might be reckoned a branch thereof, as if foreshowing the type of the brow-antlered weapon of the deer.

The breadth of the cranium between the hind part of the bases of the ("supratemporal") horns (*b*, *b′*) is $13\frac{1}{2}$ inches. This dimension rather rapidly contracts towards the orbits (*o*, *o*), reducing the breadth between the fore part of the post-orbital tuberosities (12) to $8\frac{1}{2}$ inches. Thence the skull narrows to the single median nostril (Plate 37, fig. 1, *ol*), between the outer walls of which it is reduced to 4 inches in breadth, the vertical diameter being about the same. The breadth of the preserved maxillo-premaxillary arch (ib. ib., 21, 22) is $6\frac{1}{3}$ inches.

The base of the small horn-core (*e*) is subcircular, about 2 inches in diameter; its length is $1\frac{1}{2}$ inch; it ends more obtusely than the core (*b*), of which it seems to be a branch, and projects obliquely downward and outward.

Somewhat in advance of this rises a third larger core, or tuberosity (Plates 37 and 38, fig. 1, *c*), projecting outward from the upper and lateral border of the cranium, overhanging the broad vertical zygomatic plate (26, 27). The base of the core (*c*) measures about 3 inches from behind forward, and rather less transversely; it rises about an inch above the cranial level.

A lower tuberosity (ib. ib., *f*) with a broader base rises from the upper surface of the cranium, behind the last described and nearer the mid-line: its summit, rugged as in the others, is more transversely extended or ridge-like; the horn which it probably supported would be characterised by its transversely broad base.

Each of the cores (*c*, *e*, *f*), like that marked *b*, is one of a pair, of which the first (*b*) and third (*f*) are preserved on the left as well as on the right side of the cranium; the core (*c*) has been broken away with its supporting part of the cranial plate on the left side.

The rugose surface (ib. ib., *d*) upon the nasal region indicates the sutural attachment, or fractured base, of a horn-core. It is single, symmetrical, transversely ellipsoid in shape, $2\frac{1}{2}$ inches across, and 1 inch in the skull's axis. It is situated $2\frac{3}{4}$ inches behind the fore end of the skull.

On the right side of the skull, 4½ inches of the outer wall (ib., *oc*) extends behind the supra-temporal horn-core (*b*). The broken edge of this portion of skull gives ½ inch thickness of rather compact bone, increasing upwards to 1¼ inch, with a finely cancellous texture occupying the middle two-thirds. The hind broken margin of the upper wall of the skull thins off to 2 or 3 lines. From the under surface and mid-line of this border a septum (Plate 37, fig. 1, 7′) descends for about the extent of an inch, answering to that which similarly descends from the line of the sagittal suture to articulate, in *Chelone,* with the subjacent occipital spine. On each side of this indication by the medial septum of capacious temporal fossæ the inner smooth compact surface of the bone is largely and deeply excavated.

The nasal aperture (Plates 37 and 38, fig. 1, *ol*) is overhung by the coalesced nasal bones (ib., 15) which project about 1½ inch in advance of the premaxillary (ib. ib., 22). The aperture is 2¾ inches in breadth, 1 inch 2 lines in height, partially bisected by a septal process (*n*) of the premaxillary, which rises towards, but does not meet, the corresponding thinner septal process from the under part of the nasal.

The premaxillary (ib., 22) is continued from the nostril downward, with a slight backward curve, about 2 inches beneath the olfactory cavity, the floor of which curves downward at the outlet, with little mark of boundary, upon the fore surface of the premaxillary.

All sutures are obliterated: at least I have not been able to determine any, satisfactorily, in the portions of the cranium transmitted.

A shallow channel (Plate 38, figs. 1 and 2, *on*), ½ inch broad, is continued from the nostril to the orbit, dividing, as it seems, the nasal bone (15) from the maxillo-premaxillary (21, 22) on each side of the outer surface of the skull, the channels converging as they advance to the sides of the nostril.

The lower border of the maxillo-premaxillary (ib., fig. 3, 21, 22) is subtrenchant, convex forward; the breadth of the preserved part across the ends of the semicircle, beneath the orbits, is 6½ inches. An irregular notch at the middle of the fore part of the edentulous border (ib., fig. 2, 22) seems due to accident. The sides as well as fore part of this evidence of the upper jaw curve downward and inward.

The upper surface of the nasal (15), supporting the surface for the horn-core (*d*), is broad, flattened, but laterally bends down somewhat abruptly to form the antorbital side-wall of the nasal cavity. The platform supporting the front horn (*d*) shows great thickness and strength.

The extent of skull between the nostril and orbit is 2 inches. The preserved border of the orbit (Plates 37 and 38, fig. 1, *o*) is sub-semicircular in shape. Its upper boundary extends from the orbito-nasal groove obliquely upward and backward for the extent of 2 inches; the hind boundary then bends abruptly downward and rather backward; the lower boundary is broken away on both sides of the skull; about half of the orbital floor is preserved on the left side; rather more of the roof (Plate 38, fig. 3, *o′*, *o′*) is preserved on both sides. There is a feeble prominence at the middle of the broad or thick superorbital boundary, which may indicate the share which the frontal (11) contributed to form, with the pre- and post-frontals (12), that part of the orbital frame. The latter cranial element is indicated by the subangular prominence (ib., 12) at the hind part of the boundary. The dimensions of the orbit are 2 inches in vertical, $2\frac{1}{4}$ inches in longitudinal, diameter. These relatively small cavities open upon the anterior third part of the skull—perhaps on the anterior fourth were the skull entire.

The side-wall of the skull (Plate 38, fig. 1, 26, 27), behind the orbit extending back beneath the horn-core (*e*), is vertical and (apparently has been) entire, descending from the base of the horn-core (*c*) for an extent of 5 inches. Beneath the core (*e*) is a low prominence; behind this part, and below the base of the core (*b*), is a natural vacuity (ib., fig. 1, *t*), of a vertically oval form, 1 inch 11 lines in that diameter, and apparently 1 inch 6 lines from before backward. This vacuity leads to the temporal fossa, which is entirely roofed over by the broad arched external cranial platform, developing and supporting the lateral ("supra-temporal," *b*, *c*) and superior ("supra-parietal," *f*) pairs of horn-cores.

The side-wall descends below the vertical temporal opening for an extent of 2 inches 10 lines. The outer surface of this part is slightly convex, and sculptured by some vascular channels; it is bounded behind by a shallow groove, 9 lines across, extending from the temporal opening obliquely downward and backward. The groove is bounded behind by a small rugged mamilloid process (8).

The above-described "side-wall" holds the place of a malo-squamosal zygoma (26, 27); the hinder terminal tuberosity (ib., 8) I regard as part of the mastoid.

On the left side of the skull a bony plate is continued from part of the inner circumference of the vertical temporal aperture for some distance transversely mesiad. The hinder part of this production is much thicker than the fore part, and extends further before ending in a broken surface: it was, probably, continuous with the proper parietes of the brain-case, of which, however, no trace remains.

The major part of the extensive horn-supporting plates seems to correspond with those parts of the parietals and mastoids in *Chelone*, which make the vaulted roof of the temporal fossæ.

Of the tympanics, or supporting bones of the tympanic membrane in *Chelonia*, and of the articular surfaces for those bones, there is no preserved trace.

Turning to the under surface of the present cranial specimen, the fore boundary of each "palatonaris" (Plate 38, fig. 3, *pn*) is preserved. The roof of the mouth extends forward 2 inches from these boundaries. On this palatal part of a broad upper jaw, formed, as it seems, by the coalesced premaxillary and maxillaries, projects the trenchant ridge (ib. ib., *r*), extending nearly, but not quite, parallel with the outer margin (ib. ib., 21, 22); it is somewhat sharper than that margin, from which it is divided by a pretty deep regular channel, widening from 6 lines in breadth at the mid-line of the mouth to 9 lines at its outer, best preserved, end. Behind the second ridge is a third lower but equally trenchant one (ib. ib., *s*), with a smooth canaliculate interspace of 6 lines broad between it and the second ridge, with which it runs parallel and is nearly co-extensive.

From near the lateral and posterior parts of the palatal portions of the skull the smooth arched roofs of both orbits (ib. ib., *o′*, *o′*) are preserved for an extent of from 2 to 3 inches.

The shape and superficies of the curved ridges and channels on the prepalatine part of the upper jaw indicate that such part was sheathed with horn in the living *Megalania*. This Chelonian character is associated, as I have remarked, with that of the osseous expanse over-roofing wide temporal vacuities. But the chief affinities, vertebral as well as cranial, of *Megalania*, are with the Lacertians, and more especially, as I have next to show, with a Lizard still living in and peculiar to the Australian continent.

In the existing *Lacertilia* there are four known genera with horned species: *Ceratophora*, *Phrynosoma*, *Metopoceros*, and *Moloch*. In the first genus (*hab.* Ceylon) the so-called horn is single, supra-nasal, elongate, flexible, little different in texture from the common integument. In *Ceratophora Stodarti* (Plate 37, fig. 6) it is subcompressed, pointed, of moderate length; in *C. aspera* (ib., fig. 7) it resembles rather a short proboscis than a horn. In *Phrynosoma regale* (*hab.* California) a semicircle of antero-posteriorly, sub-compressed, broad, corneous spines (ib., fig. 8) crowns, as it were, the occiput; there are some corneous papillæ in other parts of the head. In the Iguanian genus *Metopoceros* (*hab.* S. America) the species *M. cornutus* carries a single symmetrical short horn upon the nasal region.

Only in the small Australian Lizard* (*Moloch horridus*, GRAY†) have I found a head resembling in its proportionate breadth and shortness that of *Megalania*, with the following correspondences in the cranial armature, seven of the horns (Plate 37, fig. 2, and fig. 9, *b*, *c*, *d*, *e*) answering to those similarly marked in fig. 1, ib.

The horns of the pair (*b*), which are the longest in *Moloch* as in *Megalania*, are also the largest and widest apart; they spring from the sides of the upper part of the head near to but in advance of the occiput: they are the "supra-temporal horns." A shorter horn (ib., fig. 2, *e*) projects close to the fore part of the base of (*b*), and seems a repetition of the horn marked (*e*) in *Megalania*. The horns of the pair placed nearer together and springing from the upper part of the head (ib., fig. 2, *c*) correspond to the "post-orbital pair" (fig. 1, *c*, *c*) in *Megalania*; but the large proportional size of the orbits in *Moloch* makes them more approximate. The most advanced horn (*d*) on the upper part of the head is single and symmetrical in *Moloch* and repeats the

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* Discovered by JOHN GOULD, F.R.S., in the Swan River district, and exhibited by him as a "spiny Lizard allied to the Agamas," at the meeting of the Zoological Society, August 5th, 1840: Proceedings, p. 94, 8vo., 1840.

† "Descriptions of some new species and genera of Reptiles from Western Australia discovered by JOHN GOULD, Esq.": 'Annals and Magazine of Natural History,' vol. vii., 1841, p. 88.

"supra-nasal horn" in *Megalania* (Plate 38, fig. 1, *d*). The larger horns in *Moloch* (Plate 37, fig. 2, *b*) curve obliquely outward and backward; the "post-orbital" (*c*) and "nasal" (*d*) horns are vertical: both are short. Moreover, in *Moloch* a pair of horns of intermediate size, but broad basally in proportion to their height (ib., fig. 2, *a*), stand upright, their bases touching each other above the occiput. There is not such good ground for homologising these with the "supra-parietal pair" (ib., fig. 1, *f*, *f*), but the extension in breadth of the summit of these horn-supporters in *Megalania* is notable in relation to this comparison.

The occipital segment of the skull had not come to hand at the date of Mr. G. F. BENNETT'S discovery and transmission of the parts above described; but the previous acquisition of that cranial vertebra (Plate 36, figs. 1 and 2), by M. ST. JEAN, of another *Megalania*, in a different locality, has enabled me to show, in the free tuberous termination of the superoccipital spine (ib., *ns*) and the restricted attachment by confluence in other elements with the cranial segment in advance, characters which are more closely repeated in the skull of *Moloch* (ib., fig. 5) than in other Lacertian subjects of comparison.

Moreover, in the skull of *Moloch* (Plate 37, figs. 3, 4, 5) a single edentulous premaxillary (22) is sheathed with horn. It is relatively smaller than the similarly edentulous upper jaw-bone of *Megalania*, and the retained sutures in the small horned Lizard show the articulation at each side-end of (22) with a maxillary (21). The premaxillary sends up a short medial process which partially divides the single external nostril (ib., fig. 5, *ol*), but does not reach the nasal (15). This bone forms, as in *Megalania*, a broad, mainly horizontal platform, uniting behind with a similarly broad mid-frontal, and laterally with the nasal process of each maxillary (ib., fig. 5, 21) and with a portion of each pre-frontal (14).

Each maxillary in *Moloch* supports a single series of minute teeth, acrodont in attachment, slightly increasing in size as they recede in position. These denticles are close set, 20 in number in each maxillary. The malar is broad, ascends obliquely backward to join the post-frontal, and, by a short slender process, combines with a short and broad squamosal to bound the temporal fossa (ib., *t*). A small mastoid and the posteriorly-produced angles of the parietal form the joint for a broad tympanic (ib., fig. 4, 28).

There is a small transverse vacuity between the parietal and frontal representing the "foramen parietale;" a pair of similar "fontanelles" open between the parietal and super-occipital, the division being partially made by the anteriorly-produced tuberous occipital spine (fig. 3, 3). The palatonares (ib., fig. 4, *n*) are small and anterior, divided by transversely-extended palatines from the larger pterygo-maxillary vacuities (*y*) behind. The parietal develops a pair of short conical processes or "cores" for the support of the vertical horns (fig. 5, *e*, *c*). There is no such process for the single nasal horn (*a*).

In the skeleton of *Moloch horridus* (ib., fig. 9) there are 21 vertebræ between the skull and sacrum; of these, 14 support movable ribs, leaving four "cervical" and three "lumbar." The two sacral vertebræ have sub-depressed centrums, and send outward long and strong costal processes (Plate 35, fig. 5), which converge to abut against the vertical ilium. The tail includes about 20 vertebræ, many of which (ib., fig. 6) support a hæmal arch and spine (*hs*) upon a pair of hypapophyses near the hind ball of the centrum. The costal vertebræ (Plate 34, figs. 3 and 4) are miniature repetitions of those in *Megalania:* the anterior cup and posterior ball show a similar shape and obliquity of position. The neural arch has coalesced with the centrum, which is relatively to the spine rather longer. The rib articulates with a single tubercle beneath the pre-zygapophysis. Of the ribs, the fifth to the ninth inclusive are connected by progressively lengthening hæmapophyses to the margins of a broad sternum. Both fore and hind limbs are pentadactyle and unguiculate. The third and fourth digits are longest; the hind foot is rather longer and narrower than the fore foot, but both show the short Agamian proportions.

A fossil fragment of flat bone, with a moderately convex border roughened as for the attachment of cartilage, 9 inches in breadth and 2 inches in thickness at the narrower fractured end, best corresponds with the expanded end of the scapula supporting the gristly superscapula in *Moloch.* This massive portion of bone was transmitted, with vertebræ of *Megalania,* from the neighbourhood of Melbourne by F. M. RAYNAL, Esq., in 1862.

In the Supplement, No. IX., of a 'Monograph on the Fossil Reptilia of the Wealden and Purbeck Formations,'* I described and figured certain fossils from the 'feather-bed' sub-division of the latter locality. From their number and the association of these fossils, called "granicones,"† with unquestionable remains of Lacertians, I conceived that they were, most probably, the osseous supports of horny developments of the integument, affording the extinct *Nuthetes* a defensive armour, like that of the *Moloch horridus;* and I alluded to the association of Marsupial Mammals with such fossils as supporting the interpretation suggested by the smaller Lizard, now living at the Antipodes in like Mammalian association. The dermal interpretation of the osseous "granicones" was further supported by their intimate texture, the evidences of which were submitted to the Royal Microscopical Society of London.‡

In the investigation of the structure of the horns and spines of *Moloch horridus* it was found that the density of the supporting cones of fibrous corium was not augmented by bone-deposits, but indications of such decussatory fibrous structure in the ossified cones were plain.

In the huge extinct horned Lizard of Australia the horn-cores, as we have seen, are ossified, and the texture of the bone, as revealed by the microscope in thin transparent

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* Volume of the Palæontographical Society, issued 1879, 4to.

† *Op. cit.*, p. 15, Plate 11, figs. 17–21.

‡ Journal of the Royal Microscopical Society, 8vo, vol. i, 1878, p. 233, Plates 12, 13.

sections, closely agrees with that of the granicones or assumed cores of the horns and spines of the extinct Lizard associated with the Marsupials at the Upper Oolitic or Wealden period in our own island.

In other, older, and larger extinct Saurians * the osseous supports of such horns and spines are likewise, as in *Megalania*, the sole evidences remaining.

It is interesting here to note the continuance of multiplied pairs of cranial horns in certain extinct Mammals of the earlier tertiary periods: as, *e.g.*, the four-horned Sivathere and Bramathere of the Sivalik miocene. In the *Dinocerata* (MARSH †) of the Rocky Mountain miocene, the number of such seeming cores comes still nearer to that in *Megalania*. True it is that objections to the term "horns" applied to certain elevations of the outer table of the skull in that extinct family, might similarly affect those marked *f* in the skull of *Megalania*, but the weapons which feebler cranial indications sustain in *Moloch* have weighed with me in the foregoing descriptions.

What, it may be asked, were the habits of life of this hugh Australian reptile of diabolic aspect? With regard to its small existing representative, the name *Moloch horridus* is expressive of the emotions excited by its physiognomy rather than indicative of its zoological characters, and the nature of such emotion may be judged by the nomenclator's admission that "the external appearance of this Lizard is the most ferocious of any that I know." ‡

It is nevertheless a poor harmless, timorous, little Lizard; a contemporary it may have been with *Megalania*, and indebted for its continued existence, as a species, to a dwarfishness favouring concealment, and to such defence as its tegumentary spines may offer against the small existing and contemporaneous predatory enemies. The reptilian *Megalania*, from present dental evidence, seems to have been phytiphagous, and accordingly, like many herbivorous Mammals, it was provided with defensive weapons. These would be as available against the attacks of *Thylacoleo* as the Buffalos' horns are against those of the South African Lion. But the time at length arrived when a more fell destroyer then either the marsupial or placental four-footed Carnivore came upon the stage. Then, I conclude, drew nigh the date of extirpation of every large animal that afforded meat to the Australian, so called, "Aborigine."

Hence the Naturalists' knowledge of the huge species, so extirpated, rests upon reconstructions based on comparisons of their fossil remains.

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* *Hylæosaurus* (dorsal spines), MANTELL: Phil. Trans., 1841, p. 131.

Scelidosaurus (dorsal, lateral, subcaudal spines), OWEN: 'Monograph,' in 4to. vol. of Palæontographical Society, issued 1862, p. 20, plates 1–9.

Iguanodon (carpal spines), OWEN: 'Monograph,' in 4to. vol. of Palæontographical Society, issued 1872, p. 6, plates 1 and 2.

Stegosaurus (numerous spines—position uncertain), MARSH: 'American Journal of Science and Arts,' vol. xix., 1880, p. 258.

† MARSH: 'American Journal of Science and Arts,' vol. v., 1873, p. 486.

‡ GRAY, *loc. cit.*, p. 88.

ADDENDUM.

(Added October 15, 1880.)

From the subjects of Part I. (1858) the inference was that a Land-Lizard of unusual size had existed in Australia; suggesting further quest of such character among existing Lizards, with the result that the largest known species was Australian. Any doubt that lingered was as to the validity of separating generically *Megalania* from *Hydrosaurus.* It was possible that the discovery of the fossil skull might require a generic synonymy with the existing carnivorous species; and it seemed very probable that, in habits, the extinct might agree with the large existing Lizard.

As years elapsed with successive acquisitions of other parts of the great extinct Lizard, and especially the reception, in 1866, of the occipital vertebra, these fossils led to the detection of such differences in the corresponding parts of *Hydrosaurus giganteus* as to confirm the original inference of generic distinction. But other portions of the skull were wanting to deal profitably with this advance of insight. Accordingly, my instructions and desires were pressed importunately on friendly collectors and transmitters of Australian fossils; and, in 1879, met with the return which has enabled the above contribution of Part II.

DESCRIPTION OF THE PLATES.

PLATE 34.

Fig. 1. Side view of a dorsal vertebra. *Megalania prisca.*
Fig. 2. Front view of the same. Ib.
Fig. 3. Side view of a dorsal vertebra. *Moloch horridus.*
Fig. 4. Front view of the same. Ib.

All the figures are of the natural size.

PLATE 35.

Fig. 1. Back view of a sacral vertebra. *Megalania prisca.*
Fig. 2. Under view of the same. Ib.
Fig. 3. Front view of a caudal vertebra. *Megalania prisca.*
Fig. 4. Side view of the same. Ib.
Fig. 5. Front view of a sacral vertebra. *Moloch horridus.*
Fig. 6. Side view of a caudal vertebra with the hæmal spine. Ib.

All the figures are of the natural size.

PLATE 36.

Fig. 1. Back view of the occipital vertebra. *Megalania prisca.*
Fig. 2. Front view of the same. Ib.
Fig. 3. Front view of the occipital vertebra. *Iguana tuberculata.*
Fig. 4. Back view of same. Ib.
Fig. 5. Back view of the occipital vertebra. *Moloch horridus.*

All the figures are of the natural size.

PLATE 37.

Fig. 1. Oblique upper view of the skull (wanting under jaw); nearly half the natural size. *Megalania prisca.*
Fig. 2. Oblique upper view of the head. *Moloch horridus.*
Fig. 3. Upper view of the skull. Ib.
Fig. 4. Under view of the skull. Ib.
Fig. 5. Front view of the skull (wanting under jaw). Ib.
Fig. 6. Side view of the head. *Ceratophora stodarti.*
Fig. 7. Side view of the head. *Ceratophora aspera.*
Fig. 8. Front view of the head. *Phrynosoma regale.*
Fig. 9. Skeleton, with outline of body. *Moloch horridus.*

All the figures, save fig. 1, are of the natural size.

PLATE 38.

Fig. 1. Side view of the skull (wanting the occipital segment and under jaw); one-third the natural size. *Megalania prisca.*
Fig. 2. Front view of fore end of skull; half the natural size. Ib.
Fig. 3. Under view of the same; half the natural size. Ib.

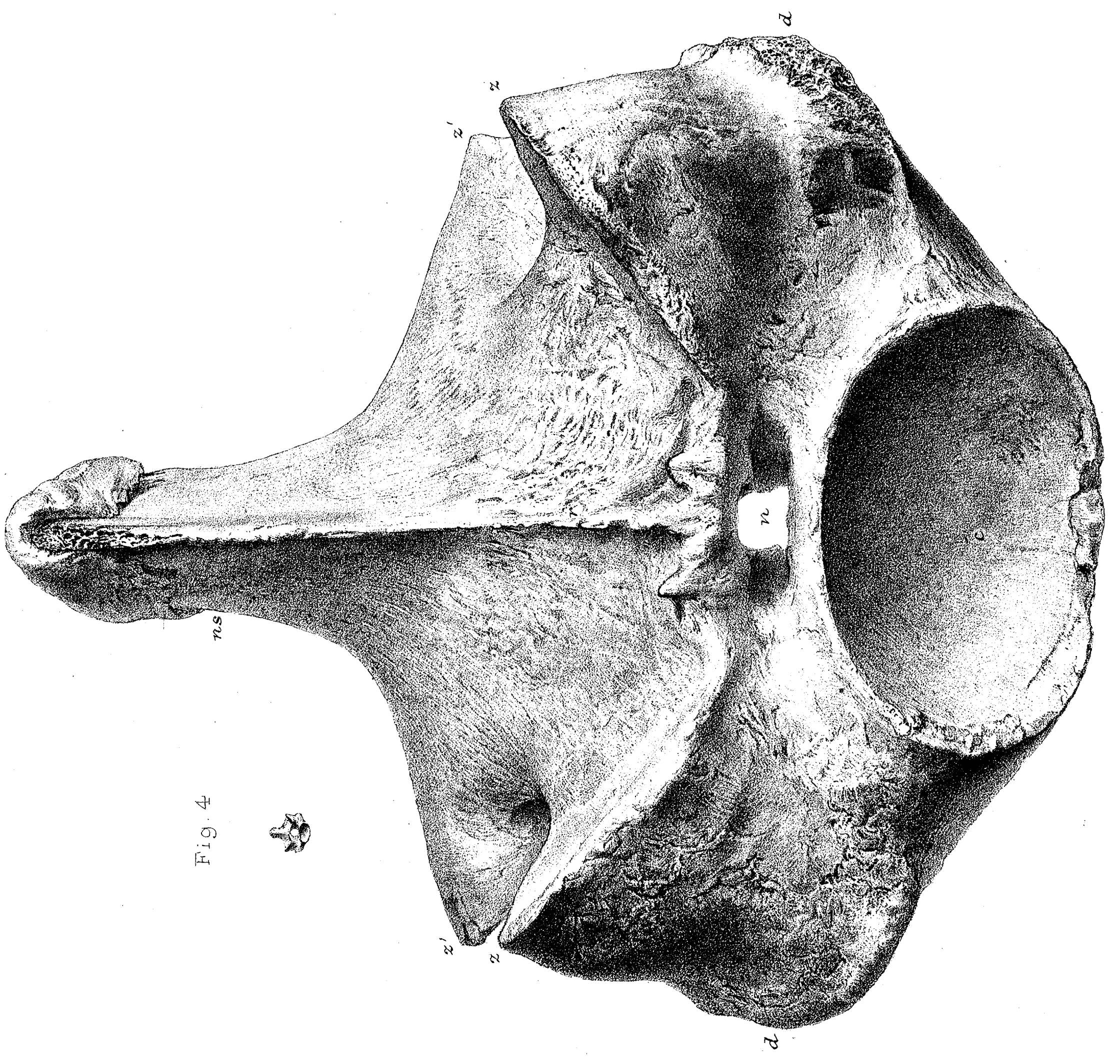


Fig. 2.

Fig. 4

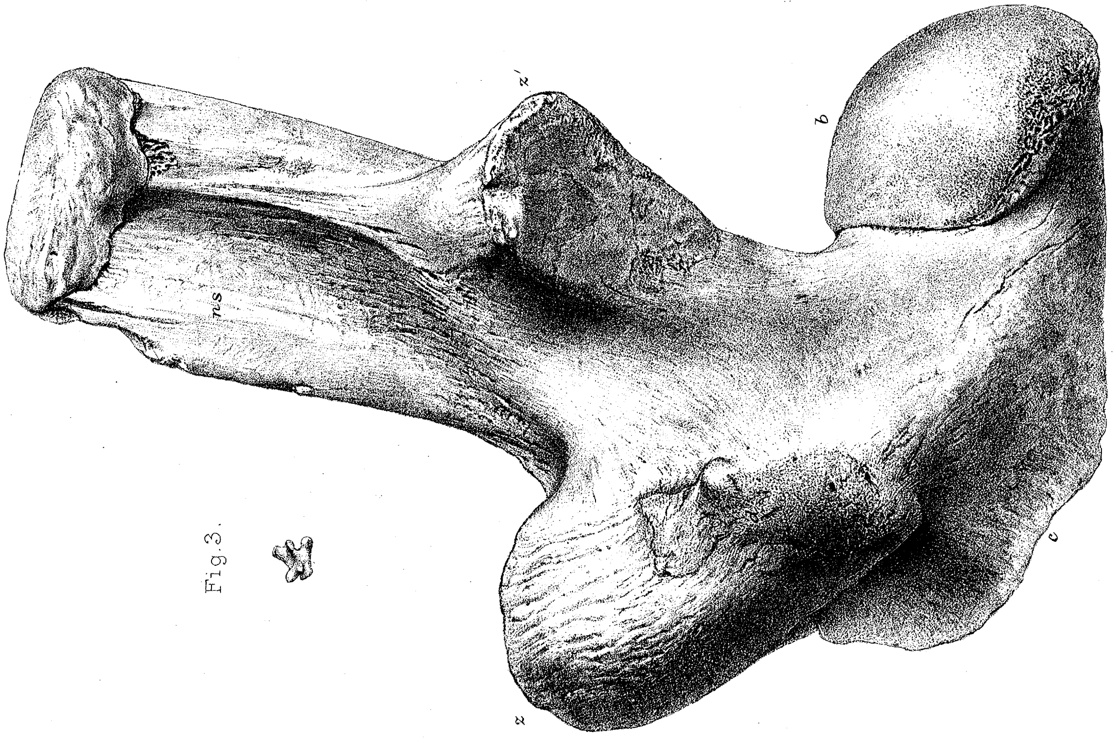


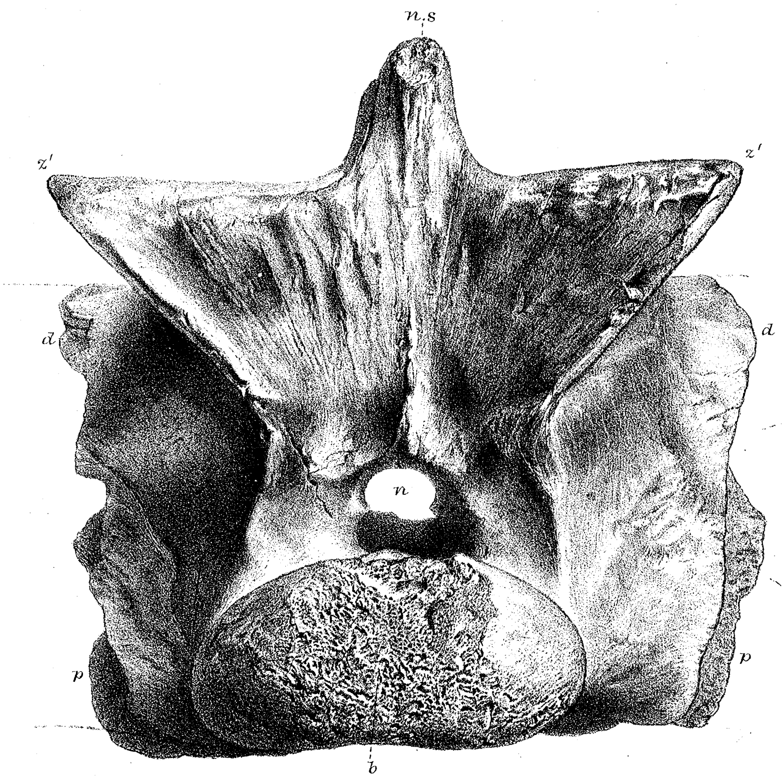
Fig. 1.

Fig. 3.

W.H. Wesley ad nat. del.

West, Newman & Co. imp.

Fig. 1.



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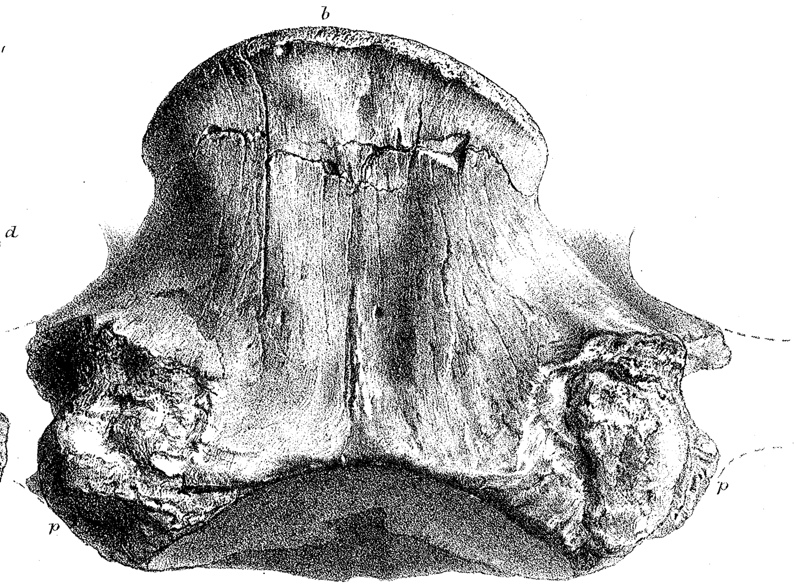

Fig. 5.

Fig. 6.

Fig. 3.

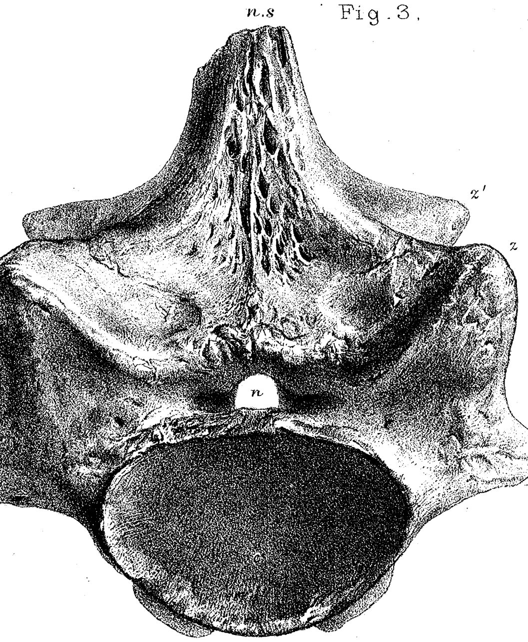

Fig. 4.

W.H. Wesley ad nat lith.

West, Newman & Co. imp.

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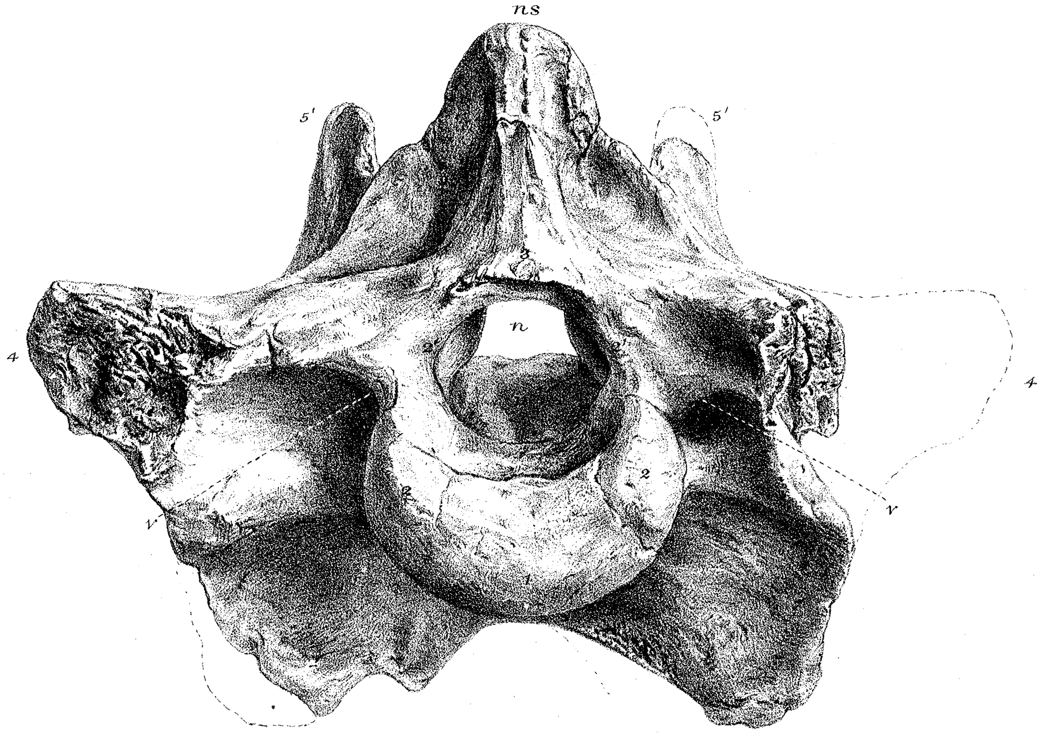

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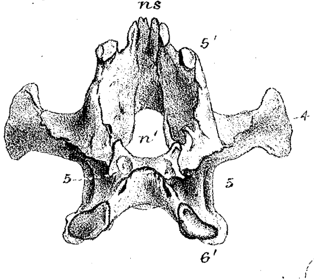

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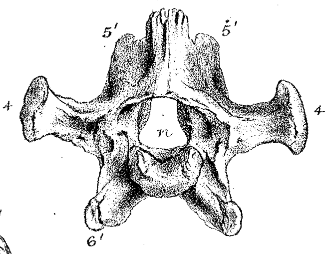

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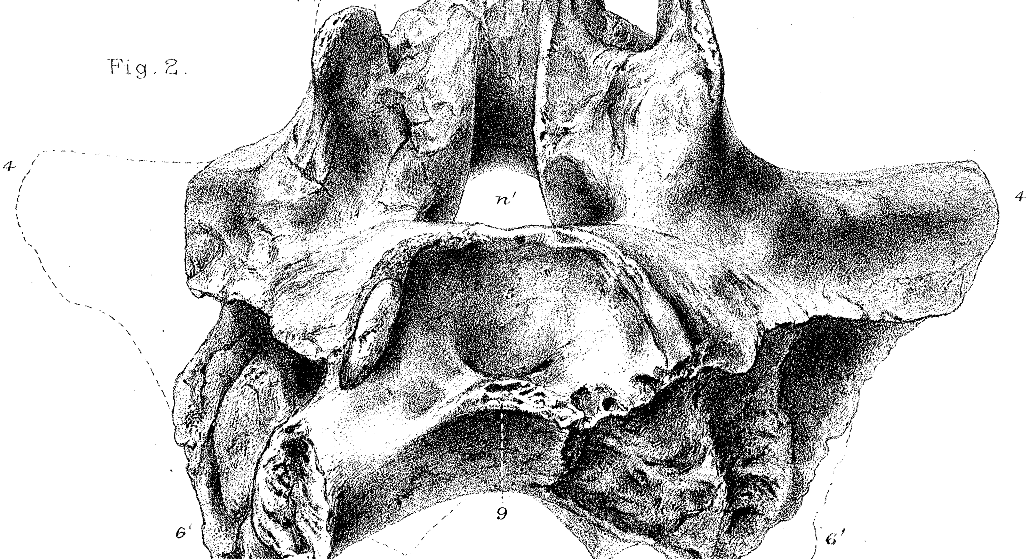

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Fig. 1.

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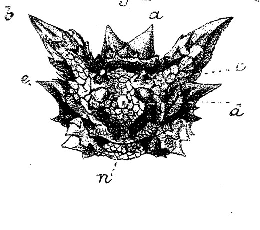

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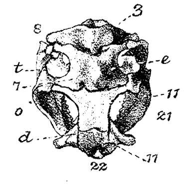

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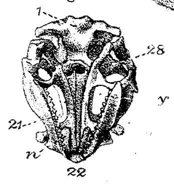

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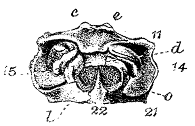

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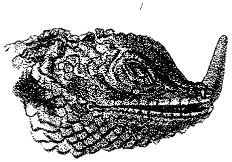

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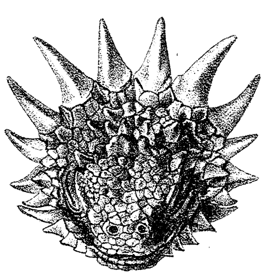

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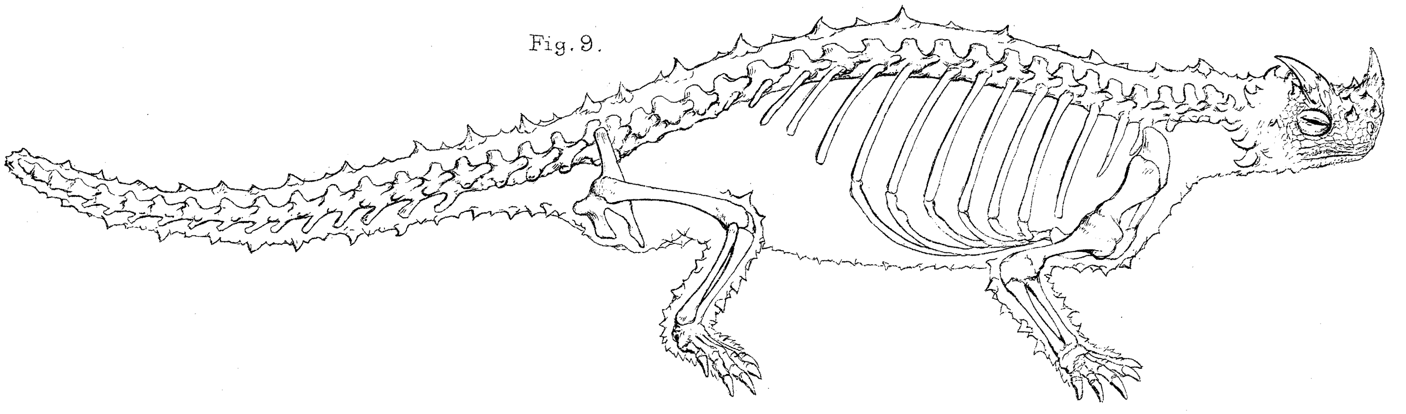

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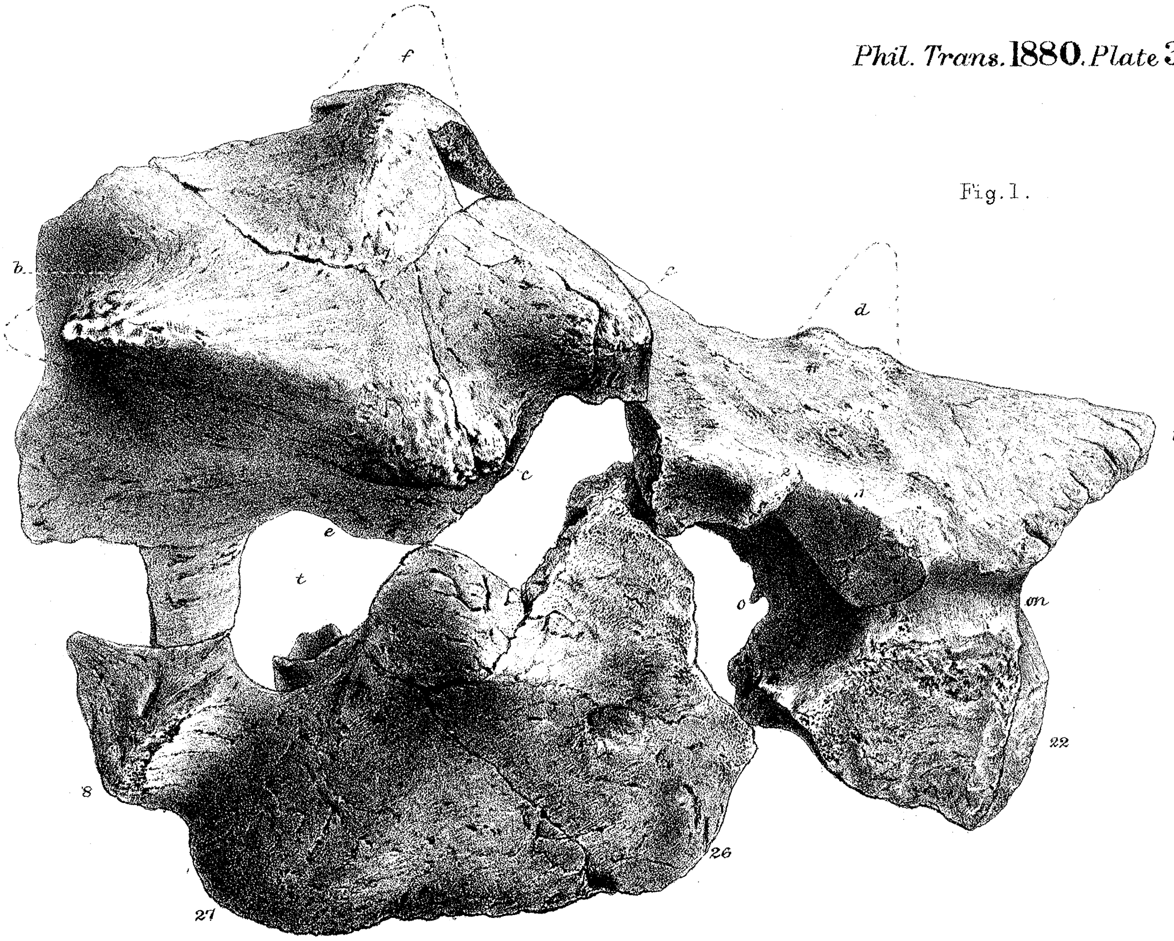
Fig. 1.



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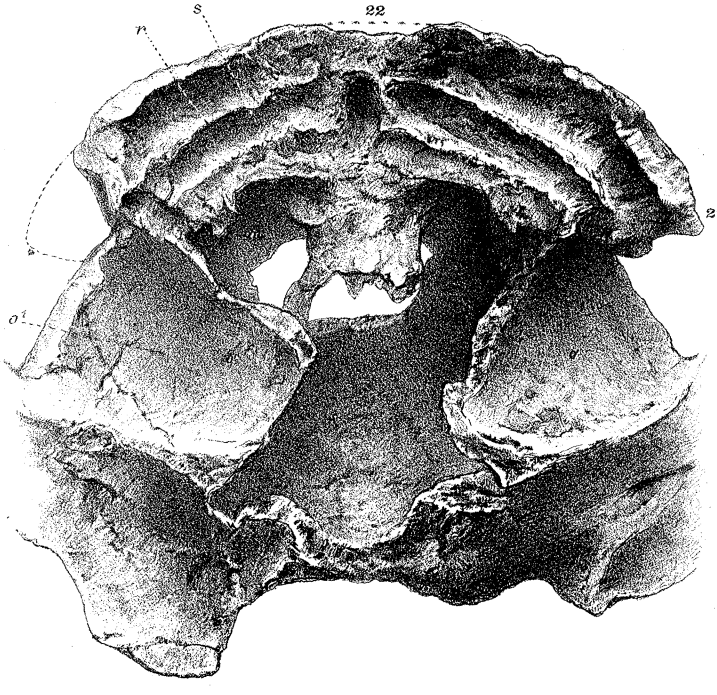

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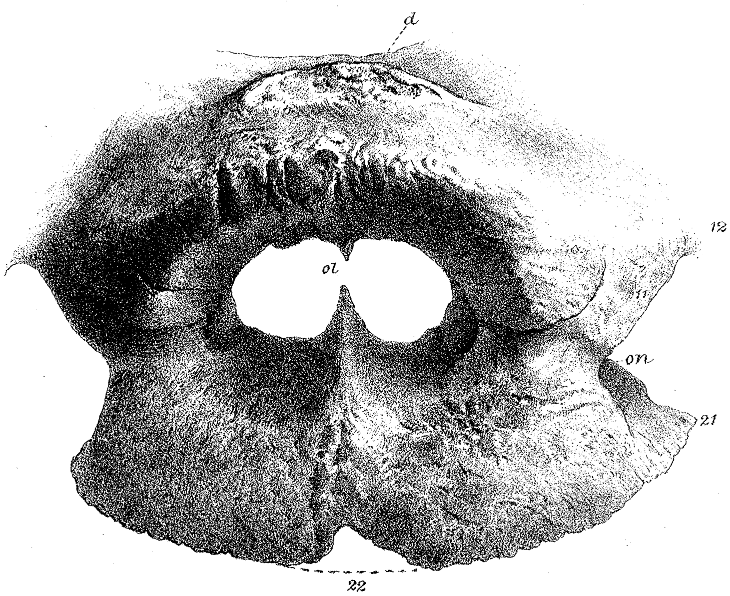

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