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ORIGINAL ARTICLES.

I.—ON *SAUROSTERNON BAINII*, AND *PRISTERODON MCKAYI*, TWO NEW
FOSSIL LACERTILIAN REPTILES FROM SOUTH AFRICA.

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(PLATES XI., XII.)

SOME time since Prof. T. Rupert Jones directed my attention to a curious fossil in the British Museum, obtained by Mr. Bain from Styl Krantz, Sniewe Berg, South Africa. The matrix is of the same nature as that in which the Dicynodonts are so commonly found, and exhibits the greater part of the skeleton, but unfortunately not the skull, of a *Lacertilian* reptile, not more than seven or eight inches in length. It is represented of the natural size in Plate XI., Fig. 1. The trunk is about two and a half inches long, and appears to have attained hardly more than one-third the length of the tail, which is bent round into three-quarters of a circle, and consists of vertebræ, which are very stout near its root, but become attenuated at its termination (a). The centra of these vertebræ appear to have been slightly constricted in the middle, and are about one-tenth of an inch in length. The anterior caudal vertebræ present strong and long transverse processes. The dorsal vertebræ can hardly have been fewer than eighteen or twenty, and seem also to have possessed hour-glass shaped centre. They are for the most part provided with long curved ribs, the hindermost four or five pair of which become gradually shorter. One or two vertebræ in front of the sacrum may have been devoid of ribs.

Both the fore and the hind limbs are in place, though but imperfectly preserved. The impression of the large semilunar coracoids (Figs. 1 and 2 b) which meet, and perhaps overlap in the middle line, is very distinct. But one of the most interesting features of the fossil, and that which best indicates its relation with the typical *Lacertilia*, is the great T-shaped, or rather crossbow shaped, episternum or interclavicle (Figs. 1 and 2, c), which in its general form and properties closely resembles that of the existing Monitors. The clavicles themselves are not to be distinctly made out. The humerus is equal to about 7 vertebræ in length, and possesses a cylindrical shaft, which

is moderately expanded at each end. The radius and ulna are rather shorter than the humerus. The manus (Fig. 2 *d*) has slender digits, some of which were certainly terminated by claws, and which seem to have been present in the full number of five. The impression of the pelvis is distinctly visible, though its details cannot be clearly made out. The femur is a long and strong bone, not notably dilated at either extremity. The tibia is stouter than the fibula; both bones are considerably shorter than the femur. The total length of the leg without the foot is 1·8 inch; that of the fore-limb without the manus is 1·4 inch. The foot, represented as twice the size of nature, in Fig. 3, seems to have been penta-dactyle, with slender digits, the largest of which could hardly have been shorter than the tibia.

Our knowledge of the characters of the trunk and of the limbs of the Dicynodonts is very defective, but the limb-bones of this skeleton are so unlike any of the corresponding bones which are known among the Dicynodonts, that I think there can be little doubt that the fossil is not the trunk of *Dicynodon*. On the other hand, it is in many respects curiously like *Telerpeton*, and I am disposed to think that the little African reptile, which may be called *Saurosternon Bainii*, was really allied to that famous Lacertian.

At the International Exhibition held at Paris last year, Mr. McKay, of British Kaffraria, exhibited a model of "East London and the Harbour Works at the Mouth of the Buffalo River, British Kaffraria, Cape of Good Hope," with some geological sections. The latter are thus described:—

"EXPLANATION OF GEOLOGICAL SECTIONS. (Figs. 1 & 2.)"

- "A.—Is a Permian formation, most probably of the age equivalent to the Magnesian Limestone of England and Zechstein of Germany. Its freshwater origin is inferred from the total absence of Marine remains, particularly shells—and the presence of multitudes of remains of reptiles capable of existing on land or freshwater—together with the remains of land-plants in the erect position in which they grew.
- D.—Is a wind-stratified Post-Tertiary formation which fringes the coast for a considerable distance (it has been traced from the Kowie to Natal), but does not extend any distance inland, generally under a mile. It is, in fact, nothing more than consolidated sand hills, which, in some places, attain a height of 200 feet and upwards. The hillocks of loose sand that skirt the coast at the present day are identical in composition, stratification, and organic remains.
- E.—Is a stiff, reddish, yellow clay, with a considerable proportion of calcareous matter; pellets and nodular concretions of lime are dispersed throughout it. It occupies all the depressions in the surface of A, and, in consequence, is very irregular in thickness, ranging from 5 to 150 feet. No fossils have yet been found in it.
- F.—A thin layer of ironstone gravel, containing rolled fragments of silicified wood, agate, cornelian, chalcedony, etc.
- G.—A rich, dark, earthy clay, from 2 to 5 feet thick, with thin layers of existing marine shells sparingly dispersed in it. These marine remains have been found at an elevation of 800 feet ("sic. in Mr. McKay's MS., at p. 204 he says 200 feet") above the present sea level, so that the land must have been quiescently submerged to that depth within a very recent period.
- H.—This deposit owes its origin to an obstruction across the mouth of the river, which has penned back the water and converted the estuary into a temporary lake, about 20 feet above its present level—three distinct occurrences of this obstruction

are plainly seen. After carefully observing most of the mouths of the rivers on our coast, I am satisfied that they are all more or less liable to periodical obstructions of this description.

It is only in this deposit (H) that traces of man have been found. They consist of implements, fragments of native pottery and charred wood.¹ It is only when the fossils are close to the underlying hard rock that the process of concretion and cementation has made any advance, otherwise they are loose in their bed, or are beached up in heaps of loose shells and rubbish in a direction against the sea, as in H, Fig. 1."

Fig. 1. Hills inside Estuary at the mouth of the Buffalo River, British Kaffraria, Cape of Good Hope. H, Bed of Shells—to H. in Fig. 2.

Fig. 2. Order of Super-position of Deposits, Buffalo River.

"LIST OF FOSSILS OBTAINED BY MR. MCKAY, OF BRITISH KAFFRARIA."

"Bed A.—All the animal remains of this group are presumed to be Reptilian. No. 1. Section of Vertebræ. No. 2. Vertebræ and ribs. No. 3. Skull of *Dicynodon*, tusks directed forward, inward, and downward; the mouth and temporal fossæ analogous to the existing turtle. No. 4. Bones of the feet, ribs, etc. No. 5. Part of a Skull. No. 6 and 7. Vertebræ and ribs. No. 8. Jaw with teeth placed in a groove. No. 9. Upper and lower jaw with teeth, one of which is serrated. No. 10. Jaw with teeth in distinct sockets, large teeth to the front, and gradually diminishing in size towards the posterior part of the jaw; remarkable for the massiveness of the jaw in proportion to the size of the teeth. No. 11. Small jaw with a row of cylindrical teeth and four supplemental teeth compressed and serrated on the anterior edge only; some elements of the lower jaw. No. 12. Vertebral column of a small reptile; some bones of the legs and sternum. No. 13. Skull with teeth in a groove. No. 14 and 15. Skulls. No. 17. Serrated tooth; two other teeth of this description in my possession are deeply implanted in distinct sockets in a massive jaw; they are serrated on both edges—an attempt was made to clear the serration on the other edge of No. 17, but it was found too brittle, and it shivered with the lightest tap. No. 18. Tooth; the cast of the point of the tooth suggests indentation on the edge of a right angle, rather than projecting serrations; it was associated with No. 17. No. 19. Part of skull and lower jaw teeth, some of which are serrated. Concentric ring-marks are visible in section. No. 20. Rib? No. 21. Tibia? No. 22. Ribs and bones of the feet or paddles? No. 23. Bones of the feet fragments of the jaw and teeth, etc. Lastly. Many plant impressions, ripple marks, and cast of rain drops.

¹ Since the above was written, Mr. McKay has discovered a fragment of native pottery in a layer of existing shells in the bed G.

Bed D.—Existing land shells, casts of existing marine shells, vertebrae of shark, claw of crustacean, bone of land animal, existing marine shells and fragments.

Beds E, and F, are unfossiliferous.

Bed G, contains existing marine shells 220 feet ("sic. in Mr. McKay's MS., at p. 202 he says 800 feet") above the present sea-level.

Bed H, yielded teeth and tusks of *Hippopotamus*; stone ring used by Bushmen. (They are wedged on to the pointed sticks as make-weights to assist in digging up roots.) Lastly. Fragments of native pottery."

The specimen represented of the natural size in Pl. XII. Fig. 1, is from Bed A, and is the fossil marked No. 9 in Mr. McKay's list. It is a shattered lacertilian skull having very much the general shape of that of *Rhynchosaurus*, being very broad posteriorly owing to the large size of the supratemporal fossa (a), and tapering anteriorly. The extremity of the snout is broken off. The large orbits (b) looking almost directly upwards, lie in the anterior half of the cranium, and are separated by a relatively narrow interorbital space. What appears to be a parietal foramen is situated in the sagittal suture near the truncated occipital margin of the skull. The mandible is very much broken, but what remains of it shows that it was remarkably thick, and that it was provided with teeth, the best preserved of which is represented of twice the natural size in Fig. 1 a. Eight or nine such teeth can be counted in relation with the left ramus of the mandible between d and d. Each of these teeth is straight, flattened from side to side in the crown, but more cylindrical in the fang, and contains a pulp cavity, which extends nearly to its summit, and is wide in the crown of the tooth. The anterior edge of each tooth is like its surface, smooth and rounded, but the posterior is produced into relatively strong and long denticulations.

The ramus of a mandible of the same animal, is represented of twice the size of nature in Plate XII. Fig. 2. From the arrangement of the teeth in this and in the foregoing specimen, it appears that they were not disposed in distinct alveoli, but lay close together in a groove of the bony substance of the jaw. The symphyseal end of the ramus (a) seems to have been devoid of teeth.

The successional teeth are well seen in various stages of development at the bases of those which are fully formed. Most of the latter have been split, or ground down, so as to show their pulp cavities. I propose to name this new Lacertian *Pristerodon McKayi*.

Fig. 3, Pl. XII. is a figure, of the natural size, of another incomplete mandible, similar in its stoutness, and in the apparent absence of teeth from the symphyseal region, to the foregoing. But the transverse sections of the fangs of the teeth, which have been exposed, apparently by taking a slice for microscopic purposes, are oval, and show that the pulp-cavity is almost obliterated. The teeth increase in size from behind forwards, and a thin bony septum between the first and second gives rise to a complete alveolus for the first tooth.

The inner side of the ramus gives off a singular slender bony process, which may correspond with the flat and slender plate of

A. T. HOLLICK del. & lith.

W. WEST engr.

Saurosternon Bainii, Huxley.
A New Fossil Reptile from South Africa.

Fig. 2.

Fig. 3.

Fig. 1a

Fig. 1.

A. T. Hollis del. et lith.

W. West inv.

Pristerodon M^c Kayi, Huxley.
A New Fossil Repale from South Africa.

bone which appears to be given off from the inner side of the mandible of *Pristerodon*, nearly opposite the lower *d* in Fig. 1, Pl. XII.

DESCRIPTION OF PLATES XI. AND XII.

PL. XI.—Fig. 1. The impression of the ventral face of *Saurosternon Bainii*, of the natural size. *a*, the extremity of the tail; *b*, the coraioid; *c*, the interclavicle or episterna.

2. A portion of the counterpart. *d*, the manus; *b*, *c*, as before.

3. The left foot; from the counterpart twice the natural size.

PL. XII.—Fig. 1. The skull of *Pristerodon McKayi*, of the natural size. The greater part of the left half of the skull has split off, leaving the left ramus of the mandible (*d*) exposed. *a*, the right temporal fossa; *b*, the orbit; *d d*, the teeth.

1*a*. A tooth, $\times 2$.

2. A detached ramus of a mandible of *Pristerodon*, viewed laterally, and apparently from the inner side.

3. A similar mandible, viewed from above.

II.—ON THE CAUSE OF CONTORTIONS AND FAULTS.

By J. M. WILSON, M.A., F.G.S., &c.; Fellow of St. John's College, Cambridge; Assistant Master at Rugby School.

DURING the last few years, in lecturing on geology at Rugby School, I have frequently given an explanation of the causes that produce contortions and faults, which I find, to my surprise, is not given in the ordinary text books, and yet seems to me an extremely obvious explanation.

The explanation given by Lyell (*Elements*, p. 64), is contained virtually in the diagram he gives (Fig. 1). I quote however a few words from his book. "Suppose the mass of rock *A*, *B*, *C* (Fig. 1), to overlies an extensive chasm *d*, *e*, formed at the depth of several miles. Now, if this region be convulsed by earthquakes, the fissures *f*, *g*, and others at right angles to them, may sever the mass *B* from *A* and from *C*, so that it may move freely, and allow it to sink into the chasm."

FIG. 1.

It is clear from this that Lyell considers faults as caused by subsidence of detached portions of the crust of the earth; and since a wedge-shaped block could not so subside, the faults must be either vertical or overhanging on one side of the detached portion; that is faults would "hade to the upthrow" as often as to the downthrow, which is not the case.

Phillips, I believe, offers no explanation of faults, but points out the very general law that the plane of separation slopes under the depressed portion of the disrupted strata, expressed above by saying that faults "hade to the downthrow."

Page does not discuss the question.

Jukes discusses it at considerable length, and his explanation, in some respects, is like my own. He explains, however, the general