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On a Dinosaurian from the Trias of Utah.

BY E. D. COPE.

(*Read before the American Philosophical Society, February 16th, 1877.*)

DYSTROPHÆUS, Cope.

This genus reposes on scanty remains, but which are in good preservation, and which present marked characters. The bones consist of the humerus, three metatarsals, some ?tarsals, and the distal end of an ?ulna, with a probable sternum and an inferior element of either the scapular or pelvic arch, probably the latter. There is also a number of fragments, which are not easily identified. The specimens were discovered by Prof. J. S. Newberry in South-eastern Utah, while acting as Geologist to the Engineer Exploring Expedition under the command of Captain McComb, United States Army. He excavated them from the red and green rocks usually referred to the Trias, hence from the same formation which yielded the *Typhothorax* already described. Professor Newberry made sketches of the bones as he exposed them. They were all, he states, found in close proximity, the bones of the limb in nearly normal relation. It is altogether probable, according to Professor Newberry, that they belong to a single animal. I find nothing to forbid this supposition and much to confirm it.

One of the most remarkable bones is a broad, flat element, one of whose borders is digitate, the processes being long, and separated by deeply entrant sinuses. Two sides of the bone are broken away, but the others give origin to five digitiform processes. Two of these are larger and longer than the others, and externally on the right side is a shorter one. Outside of this is a larger process whose extremity is recurved so as to be subparallel with the longer processes, and which was connected with another bone by an articular surface. This information is derived from Prof. Newberry's notes made in the field. It is probable that this bone is the sternum, and that the articulation mentioned is costal. It is not certain whether the longitudinal meridian line passes through a sinus or a digitation, but a projection of the surface of the plate, which is probably median, is opposite one of the latter. Supposing then that the sternum is produced into a median posterior process, we find a resemblance to the corresponding element in many birds not heretofore known among reptiles. There are in that case three postero-externally directed processes on each side, of which the two posterior are free. Another interpretation might be that it is a coracoid with anterior digitations. In this case the articulation above mentioned would be anomalous. The number of digitations is too great for this element, and the space remaining for contact with the sternum is too small.

Another large flat bone approximates a right-angled triangle in form, the length greatly exceeding the width. The right-angle is massive and

produced, and is evidently the point of connection with the other parts of the skeleton. The bone is flat on one side and convex on the other, and can only be identified with probability, with the scapula of a Dinosaurian reptile.

The large size of the anterior limb, which might be inferred from this scapula, is justified by the humerus, which is preserved in almost perfect condition. This humerus is one of the longest, and is distally the most contracted known in the *Dinosauria*; the proximal extremity is of the form usual in that order. A short distance below the head, the section is T-shaped, with one end of the transverse limb shorter than the other. The ridge of which this limb is a section, is almost wanting at the head, which is thus Γ-shaped. The limb representing the stem of the T is stouter than the others, and forms the summit of a massive column, which soon sinks into the shaft. Its free extremity is obtuse and rounded, and though representing the head, does not rise above the level of the other crests, or tuberosities. The distal extremity of the humerus looks much like that of a tibia. It is truncate, and its long axis is in the plane of the tuberosities of the head. Its outline is oval, one end narrowed to an angle, and the other broadly rounded. The surface is roughened with coarse pits.

The distal extremity of another long bone, most probably the ulna, is more robust than that of the humerus. The shaft is a flattened oval, and the articular extremity is a wide and somewhat irregular oval, the greatest transverse diameter being nearer one end. The articular surface is roughened with coarse pits.

Three metatarsals were found in immediate proximity to each other, two in nearly their normal relations, and one slipped forwards. They are neither remarkable for length nor abbreviation. The proximal ends are truncate, and the distal ones convex, but without distinct median grooves or lateral angles. Both extremities are moderately expanded, and the shafts are contracted at the middle. The external bone is a little shorter than the two others, and is more flattened. It has a slightly-defined convex head, with an adjacent prominent, but ill-defined, lateral crest. The larger of the longer bones has a crest at one angle, like that of an olecranon process. The proximal end of the same bone is massive, and is trapezoidal in outline; the outline of the corresponding head of the adjacent bone is triangular. A marked character of these bones is the rough or pitted surface of their articular extremities, except the distal end of the shorter bone. The shafts are solid, and filled with nearly equal, coarse cancelli.

The bones above described are evidently those of a Dinosaurian reptile, and they present characters which have not been previously observed in any other genus of the order. The form of the condyles of the humerus distinguishes it from the other known genera, especially from those of the European Trias, where the crest is weak or wanting.

The rugose articular surfaces are also peculiar, indicating less than the usual mutual movement of the bones upon each other. A cartilaginous cap is indicated, which was probably the element from which the mam-

malian epiphysis was derived. The sculpture of the surfaces is coarser than that to which epiphyses are attached in the *Mammalia*. The name of the genus expresses this character.

It is altogether probable that this genus embraced terrestrial animals, with powerful fore- and hind-limbs subequally developed. The typical species is of gigantic proportions.

DYSTROPHÆUS VIÆMALÆ, Cope.

In the supposed sternum of this animal (which I have not seen, but which was sketched by Professor Newberry), a rather small, slender and compressed process projects from near the middle of one of the sides at right angles to it. Only two of the lateral processes are represented as complete. The longer is subspatulate; the shorter subacuminate. The scapula presents three complete borders,—the proximal and two lateral; but the distal is not known. Without it, the length is two and one-half times the breadth. The point of junction of the longer (and perfect) short border with one of the long borders, is much thickened, terminating in a mass of bone which is unfortunately broken, but whose section in the line of the end border is a wide oval. From this point, the plate thins away to the various borders. The greatest thickness is nearer the border which terminates in the enlargement described. This surface is then gently convex in transverse section, while the opposite one is concave to a less degree. It is thicker at the middle than at the anterior border in a longitudinal direction.

The proximal extremity of the humerus is much expanded. The greater tuberosity is a huge crest, as prominent as the head, and separated from it by a marked concavity which constricts the mass connecting it with the head, thus forming a neck. This concavity extends about one-third the length of the shaft. On the opposite side of the head a similar concavity excavates the shaft, separating the internal from the interior ridge. The latter is in its middle portion as prominent as the external ridge, and extends as far downwards. The extensive external face of this part of the bone is nearly flat.

The internal ridge descending from the head, continues into the posterior border of the interior face of the shaft. The great tuberosity continues into the single external ridge of the shaft, which is thus near the middle triangular in section, the base of the triangle internal. The external extremity of the distal end is therefore an angle, and the internal a convex side, shorter than the anterior and posterior sides. A ligamentous groove marks the posterior border of the extremity at a point measuring one-third of its length from the external angle. The expanse of the distal extremity is not more than three-fourths that of the proximal. The entire bone so resembles a tibia, as to have induced me to refer it at first to that element. The characters of the proximal end are such as to render such identification highly improbable. Such reference would also require that the distal extremity should have a fore and aft direction, an arrangement incompatible with the tibia.

The displaced metacarpal is flattened, and expanded at the extremities. One side is nearly flat, but slightly concave in the longitudinal direction; the other side is convex and nearly level in the longitudinal direction. The lateral borders of the shaft are thus narrowed. The distal end displays a convex condyle, and a flat, prominent ala, which is in the general plane. The ala is separated from the condyle by a deep groove on the convex side. The condyle is a half-hemisphere only, presenting only with the convex side of the shaft, from which it is not separated by a constriction. It is bounded at its distal edge by an angle, which is a continuation of the proximal edge of the ala. The proximal extremity is injured at one angle, but, with this complete, would be nearly a regular rhomboid with parallel longer and shorter outlines; the acute angle of the latter being the continuation of the lateral border of the shaft. The extremity is subtruncate, and part of the surface is irregularly excavated by pits and grooves. The transverse extent of the proximal end, when perfect, was probably a little greater than that of the distal.

The two adjacent metacarpals are subequal in length, and longer than the displaced one by one-fourth the length of the latter. One of these bones is throughout rather thicker than the other, although the transverse diameter of the shafts is equal; but the stouter bone is considerably more dilated at the extremities. The distal end of the stouter bone is thickened in the direction at right angles to the plane of the limb; but the chief expansion is in that plane. The angle next to the other bone is protuberant, while the other angle is expanded into a sharp, convex crest, or ala. A section of this extremity is diamond-shaped, with one of the lateral planes produced into this crest, while the corresponding border of the opposite side drops down, being represented by a mere convexity of the surface which continues to the crest. The surface of the extremity is irregular. The section of the shaft is a broad oval, becoming subcircular near the proximal extremity. The latter is enlarged in both directions. It is a rectangle in outline, a little extended in the plane of the limb, with one of the angles cut off from the corresponding angle to the middle of one side. The long side thus left is slightly convex, and ends in an angle. The side subtended by this angle is slightly concave, and is approximated to the other bone. The opposite side is slightly emarginate near the middle. Its surface is very slightly convex, and is irregularly grooved and pitted.

The more slender of the two bones is but little and about equally expanded at the opposite extremities. The distal end would have an ovoid section, but for the fact that it is obliquely truncate at the extremity next to the other bone. It is convex in the antero-posterior direction and plane in the transverse; its surface is grooved and pitted. The side next to the other bone is flat or slightly concave at the distal end, and, though thicker than the external border, becomes rounded at the middle of the shaft, and is again flattened at the proximal extremity. The external border is distally produced into an obtuse angle; lower down, the shaft has a thin, angular border. The proximal end has less antero-posterior diameter than

the distal, and is subtriangular in outline; the apex being acute and external. The surface is flat, and is strongly marked with deep grooves. The other surfaces of the limb-bones are smooth, except a few weak ridges near the distal ends of the two distal bones.

<i>Measurements.</i>		M.
Length of part of scapula preserved.....		0.680
Width at middle.....		0.270
Thickness at middle.....		0.048
Thickness at proximal angle.....		0.117
Total length of humerus.....		0.765
Diameter of proximal end { at head.....		0.080
	{ at tuberosities.....	0.225
Diameter of shaft { antero-posterior.....		0.080
	{ transverse.....	0.078
Diameter of distal end { antero-posterior.....		0.085
	{ transverse.....	0.145
Transverse diameter of head of humerus.....		0.160
Diameter of extremity of ? ulna { antero-posterior.....		0.110
	{ transverse.....	0.150
Length of external metacarpal.....		0.210
Proximal diameter { antero-posterior.....		0.045
	{ transverse.....	0.100
Diameter of shaft { antero-posterior.....		0.033
	{ transverse.....	0.067
Diameter distally { antero-posterior.....		0.050
	{ transverse.....	0.115
Length of median metacarpal (stouter).....		0.245
Diameter proximally { antero-posterior.....		0.057
	{ transverse.....	0.115
Diameter of shaft (transverse).....		0.055
Diameter distally { antero-posterior.....		0.074
	{ transverse.....	0.088
Length of median metacarpal (slender).....		0.240
Diameter of proximal end { antero-posterior.....		0.057
	{ transverse.....	0.089
Diameter of shaft (transverse).....		0.049
Diameter distally { antero-posterior.....		0.041
	{ transverse.....	0.083

More than usual interest attaches to this fossil. It is the first one found in the Triassic beds of the Rocky Mountain region, and was derived from an inhospitable region rarely traversed by white men. The locality is in the Painted Canyon not far from the Sierra Abajo in South-eastern Utah, near the Colorado boundary; lat. $38^{\circ} 15'$; lon. 110° . This canyon is one of those tributary to the Great Colorado River, and is without water. The rock is described by Prof. Newberry as the same as that which I

have identified in New Mexico as the Trias, and is of the usual red color. The occurrence of a terrestrial Dinosaurian at that locality tends to confirm the conclusion to which I have already attained, that this immensely extended deposit is of lacustrine character.

On a New Proboscidian.

By E. D. COPE.

(Read before the American Philosophical Society, March 2, 1877.)

I recently received from a correspondent in one of the Southern States, a fossil of unusual interest. It is a molar tooth of a proboscidian, whose color and mineral character indicate that it was derived from beds of the Upper Miocene or Loup Fork epoch. Its roots are largely broken away, while the crown is nearly perfect.

The crown consists chiefly of two transverse crests, which are separated by a deep uninterrupted valley. There is no general cingulum. Each crest is divided into three lobes, which are not deeply separated, but cause the edge of the crest to be serrate with three conic eminences. Of these the median apex has a rounder section, while the lateral are more transverse, rising at the external borders like the extremities of the crests in *Mastodon ohioiticus*. The appearance of the base of the crown at one extremity indicates that it was in contact with the preceding tooth. The opposite extremity of the base presents no such surface, and hence points to the conclusion that the tooth is the last one of the series. From the middle cone of the anterior crest a cingulum descends on each side, passing round the anterior base of the external cones. It is wanting at the extremity of the base of one of these, and little developed on the other, but they reappear on the side of the base bounding the valley. They are crenately tubercular, except at the base of the median anterior tubercle. There is no cingulum at the base of the posterior crest, except the ordinary filling between the bases of the lobes. One of the extremities of the crests is a little higher than the other, and the basis is a little wider than at the other end; it is therefore probably external in position. At the posterior base of this end is a fractured surface indicating a cingular tubercle of stout proportions, such as is more in place at the external posterior angle of the last superior molar than in any other tooth.

The external cone is defined from the median by a fissure, while a better defined depression separates the median from the internal. This depression is filled by a worn tubercle in the anterior crest. Ridges descend along the adjacent borders of the constituent cones nearly to the fundus of the valley, and the bases of the external ones are considerably wrinkled.

<i>Measurements.</i>		M.
Transverse diameter of crown.....		.130
Longitudinal " " internal.....		.070
" " " external.....		.090