ON THE DINOSAURIA OF THE EXTRA-EUROPEAN TRIASSIC[*]

by

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I. NON-TRIASSIC DINOSAURIA

CLEPSYSAURUS PENNSYLVANICUS LEA 1851

BATHYGNATHUS BOREALIS LEIDY 1854

ARCTOSAURUS OSBORNI ADAMS 1875

DYSTROPHAEUS VIAEMALAE COPE 1877

[this section not translated. – MTC]

II. TRIASSIC DINOSAURIA[1]

A. NORTH AMERICA

ANCHISAURUS COLURUS MARSH. (Pl. I(VIII) – III(X))

One of the best preserved skeletons of the Triassic is that of *Anchisaurus colurus*. But hitherto it has never been described in detail. MARSH’s descriptions are very short and his figures schematic and restored; they give a completely incorrect idea.

Through the kindness of the late Prof. BEECHER, I possess good photographs of the original, which are also reproduced here in pl. I(VIII)–III(X). Moreover the Geological Institute received a plaster cast as an exchange. By means of this material a more accurate assessment of the skeleton is possible.

THE SKULL. There are two photographs of the skull at natural size (pl. I(VIII) and one smaller (pl. II(IX)). This is compressed laterally and the bones are partly thrust together and dislocated, thus it is not as perfect as it appears in MARSH's figure. As a reconstruction, the figure is certainly very useful, only I believe the position of the quadrate is incorrect.

In the occiput on the left, the basioccipital and basisphenoid are preserved in connection with the exoccipital. The basioccipital tubera are clearly marked. The middle of the condyle is formed by the basioccipital whereas its sides already belong to the exoccipital. From the condyle a hump runs forward on the midline, likewise from the sides of the condyle to the tubera. The basisphenoid is strikingly short, and the pterygoid processes reach deep down and diverge rather strongly. The length of the basisphenoid up to the anterior edge of the processes measures only half that of the basioccipital. Deep in the shadow in the photograph (pl. I(VIII), fig. 2) one recognizes the hypophyseal pit above the processes, the sella turcica and the anterior opening of the braincase above the sella turcica. The occipital process expands on its base with three folds, of which one leads to the condyle, the second really only branches from the first, is narrow and sharp and leads down toward the tubera. Between both these first folds are two foramina, one rather larger, above in the angle of the folds, and one rather smaller, below on the narrow fold; I hold these two for hypoglossal foramina (XII). Double hypoglossal foramina for two of its ventral roots are known, e.g. in the Agamidae as SIEBENROCK has shown before; cf. *Agama colonorum* DAUD., *Sitzungsber. Akad. Wiss. Wien*, Vol. 104, 1, 1895, pl. 1, 2. The anterior root always has the smaller foramen, e.g. also in *Plateosaurus* from the European Keuper and *Megalosaurus bucklandi* from the Dogger[2]. The third fold is the main root of the exoccipital process; it is broad and strong; between this and the second fold is the large opening of the foramen lacerum and jugular foramen and in front of this broad fold the opening of the fallopian canal (facial nerve VII) must occur, as is the case in *Plateosaurus* .

The foramen magnum itself is not completely visible on any of the photographs. On pl. I(VIII), fig. 2 one sees the sharp edge of the supraoccipital above the condyle, and on pl. I(VIII), fig. 1 one recognizes the upper roof-shaped crushed edge of the same bone on the upper left. The posterior steep part of the skull cap which is formed by the supraoccipital must be constructed in a

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[1] In geographic arrangement.

[2] My description of the occiput of *Megalosaurus bucklandi* from Stonesfield (*N. Jahrb. f. Min. etc.* 190, Bd. 1:1-12) is to be corrected in these points; in figs. 2 and 3 the foramen named Car. is the anterior root of the hypoglossal, while that named XII" is probably no nerve opening but likely served as a passage for a vein or spino-occipital nerve.

roof shape, for already the inner edge of the supraoccipital shows this build. This part of the occiput is rather crushed for the frontals first follow far in front.

Both parietals are present fairly complete and in connection with the other skull bones (see pl. I(VIII), fig. 1). The squamosals are placed on the parietals as broad concave scales and curve laterally and downward behind. They close off the upper temporal fossa behind. At the lower posterior angle of the fossa the squamosal sends a short process forward that meets the postorbital from above; moreover another narrow pointed process extends downward and at the same time forms the rear edge of the lower temporal fossa. This part of the squamosal is placed on the upper half of the quadrate. However the quadrate does not seem to be fused with this process but articulates there with the squamosal, where the mentioned process has its root near the point of the postorbital. The quadrate is a long, narrow, slightly S-shaped bone that is rather expanded at its distal end and bears the joint for the lower jaw below. In its lower half the quadrate has smooth lateral and posterior surfaces, both of which meet in a sharp edge. Below the lower point of the squamosal, on the left side of the skull, one sees some bone fragments that occupy a small triangular area and extend near the quadrate, these could be remnants of the quadratojugal. Also flat pieces of bone lie on the right side at the lower end of the quadrate, which are probably identical with those of the left. The quadratojugal and squamosal do not seem to meet, as MARSH figured.

The postorbital starts rod-shaped on the squamosal and runs forward horizontally separating both temporal fossae; on it sits part of a curve that borders the rear part of the orbit and extends to its lower edge and indeed obliquely forward, particularly below and in front. The parts bordering the orbit are also thin and rod-shaped. In the middle of the lower anterior half of the postorbital is found a small foramen that opens obliquely downward.

Above the orbit (right) the right frontal is largely preserved; it is a flat bone that is thickened and curved in the middle of the lateral edge until it reaches the upper edge of the orbit. The right frontal is cut off obliquely in front on the lateral side; this at least partly natural edge and indeed that of the prefrontal (lacrimal; JAEKEL) seems to be bordered. The connection with the left frontal as well as with the parietals is lost. The left frontal lies above the right one and is visible on pl. I(VIII), fig. 1 from the medial side. The upper border of the orbit between frontal and postorbital is formed by the postfrontal, which continues the bulging orbital edge of the frontal backward. The right postfrontal is clearly visible but lost from its connection. At the lower end the broad flat bones run into a stem that unites with the postorbital.

Little is to be seen of the prefrontals; the right is entirely missing. On the right view of the skull one can see part of the left prefrontal from inside in front of the left frontal. On the left view of the skull it is clearly visible how the orbit and antorbital fenestra are separated by a narrow piece of bone; this is probably formed from the prefrontal, by analogy with *Dryptosaurus*. A separating suture cannot be seen above or below.

The lower border of the orbit is formed by the jugal. The jugal extends, as in all Dinosauria, to in front of the orbit so that the maxilla does not contribute to its boundary. Also below the orbit the jugal is narrow, rising a little in front in order to meet the prefrontal, as already mentioned; it also reaches the lower angle of the antorbital fenestra. By the posterior end it has a short rising process that reaches the postorbital; a little below this place another process branches off backward and downward, whichthe quadratojugal clearly reached. This is visible on both sides. The long, bar-shaped part of the quadratojugal is no longer preserved.

Not much clear is present of the nasal; traces of the left nasal can be recognized on pl. I(VIII), figs. 1 and 2. The nasal opening is fully visible, especially on the left side. In the imperfect preservation, nothing more can be said on the structure of the nasal except that it must have been longer than the frontal.

The maxilla begins under the posterior end of the antorbital fenestra. Like all other bones, it is lightly built and not broad. It contains about 8-9 teeth. The teeth have a broad, lancet-like shape with sharp points and narrow roots. They strongly recall the teeth of *Thecodontosaurus antiquus* which are also, as here, serrated with pointed, upward-directed, relatively large points (cf. third tooth from the front in the right lower jaw). But on the whole their preservation is very bad. Above the fourth tooth from the front, a process of the maxilla extends upward, bordering the anterior end of the antorbital fossa; its upper boundary is not preserved.

Both the premaxillae are preserved quite complete. The premaxilla borders the nasal opening in front and below; it is an angular, curved piece whose longer, broader branch forms the continuation of the maxilla and whose narrower, shorter branch curves backward and upward in an acute angle. The nasal opening is oval and its longer axis is parallel to the tooth row.

Of the palate, only both epipterygoids [transversa] are to be seen. Under the right and left jugals lie small bones, comparatively even thicker and more curved backward. Their attachment on the jugal is found below the anterior half of the orbit. In the region of the orbit of the right side are two further bones that I cannot identify.

The lower jaw is quite well preserved in its anterior part, but the middle is damaged and the posterior end lacks both jaw rami. MARSH drew 18 teeth in the lower jaw; on the photograph I can only count 15 teeth and one gap, thus 16, but at the snout point obviously 1-2 more teeth are missing, making 17-18. The dentary is strongly built and curved outward. On the left jaw ramus one sees below from inside the edge of a long flat bone; it is probably the presplenial. The upward curving of the left lower jaw is most probably formed by the surangular; certainly the suture is not visible opposite the dentary, but from analogy with other dinosaur lower jaws, like e.g. *Plateosaurus erlenbergensis* HUENE and *Dryptosaurus incrassatus* COPE (LAMBE, cf. fig. 1), this is beyond doubt. The damaged right lower jaw ramus is most interesting. The dentary is only partly preserved, but the posterior lower end in particular is still there (as I take it, at least); this part lies below the epipterygoid. On that a hollow, curved bone piece terminates backward, which I take for the (rather displaced upward) angular, which bends outward a little from inside. I think the border between angular and dentary is still preserved on the left lower jaw. On the right, high above the angular, at half the height of the quadrate, lies a part of a flat bone, ending curved upward, that I take for the highest part of the surangular. Therefore the right quadrate must be pressed into the lower jaw. Above the posterior end of the right dentary one can recognize a narrow bone piece, separated from the dentary by a suture and reaching the angular; I take this for the anterior point of the surangular. From the left side one can clearly see the right angular and above it the right quadrate. The inside of the right lower jaw on pl. I(VIII), fig. 2 is in too great shadow for anything certain to be recognized.

The reconstruction of the skull that I have attempted from the described photographs (fig. 2) yields nearly the same results as MARSH's figure. I have traced the individual bones and then attempted to bring them into natural association. The contours or sutures not preserved are dotted. In the dotted lines I have followed MARSH as far as possible because he could see more in the original than I can in the photographs. This cannot claim to be a new reconstruction but only a slight improvement on MARSH's figure of the separate elements. The only real changes are the smaller orbit and the position of the quadrate.

THE SKELETON: The skeleton[1] is preserved relatively completely (cf. pl. II(IX)); it lacks a number of cervical vertebrae, half of the left forelimb, the left manus and the tail. The parts still lie in their natural connection.

Firstly the greatly elongated centra of the dorsal and cervical vertebra are striking in comparison to *Thecodontosaurus*. Two cervical vertebrae lie in a separate small block or stone; according to their structure, they belong to the anterior section of the cervical vertebral column. They are elongated almost *Tanystrophaeus*-like and have only rudimentary spinous processes. The zygapophyses are strongly developed. The anterior of these two vertebrae is 3.8 cm long, the second with the prezygapophyses, 6.5 cm, the centrum only 5.5 cm long, this in a thickness of only 2 cm. In the large slab the rest of the vertebral column lies in connection. Counting from the front, twelve vertebrae follow after one another and there is still a half right in front; the 1-1/2 most anterior I hold for the last cervical vertebrae; the still completely preserved last cervical vertebra is 4.5 cm long, the centrum rather sharpened below, the transverse process broad with double supports and directed downward. Then eleven connected dorsal centra follow, then a gap, in which, as we shall see, were three vertebrae, and then the first sacral vertebra; thus we have fourteen dorsal vertebrae. Moreover the posterior part of the centrum of the last dorsal vertebra is also present. Dorsal vertebrae X and XI are flat below with side edges that are rounded following forward and then become flat again; the most anterior dorsal vertebra has a longitudinal edge below like the last cervical vertebra. The eighth dorsal vertebra is the longest, it (centrum) is 4.5 cm long, yet its anterior articular surface is only 2.2 cm broad and the diameter measures 2 cm in the middle; thus the length is twice as large as the breadth. The vertebrae become shorter forward and backward. The eleventh vertebra is 3.2 cm long, the tenth 3.8 cm, the ninth 4 cm; forward the length decreases to 3.5 cm (first dorsal vertebra). The neural arches of the dorsal vertebrae stick into the stone. The first sacral vertebra is 4.5 cm long, the centrum is rounded below, the right sacral rib is also 4.5 cm long and directed rather backward. Behind this on the cast (not on the photograph) one recognizes another part of the second sacral vertebra with the sacral rib (right) directed forward.

The trunk ribs are narrow and thin and strongly forked at the proximal end. Beside the two long anterior cervical vertebrae lie thin, short, strongly forked, bird-like cervical ribs. Probably two rib-like bones, which lie right outside on the right and left side, belong to the abdominal ribs.

In the right shoulder girdle one recognizes a coracoid from the shape as MARSH figured it. One only sees the articular surface of the right scapula; but the left scapula is very well presented in its proximal half from the outside. The proximal end is rather strongly expanded, but not as much as in *Massospondylus*; the crescent-shaped deepening and thickening at the anterior end of the wing process are present here as well as there. The coracoidal edge is slightly thickened. The articular notch is covered by the humerus. The wing process is 4 cm broad and its upper edge stands 5 cm above the edge between the articular surface and the coracoidal edge. The scapula describes a curve inward in front of the middle of the length. In the middle it is only 2.5 cm broad. This scapula is very like that of *Thecodontosaurus*. However, the distal end is unknown.

The humerus is also extraordinarily like that of *Thecodontosaurus*. The lateral process runs obliquely downward and is strongly turned over (cf. pl. II(IX)); the distal part (cf. pl. III(X)) is broad, but the middle of the shaft is also quite strong. Of the left humerus only the proximal part is preserved, of the right the distal. If both are combined, a length of 18-19 cm for the humerus arises. The forearm (cf. pl. III(X)), that of the right is preserved, is only 9-10 cm long. Thus MARSH's figure is to be altered in this, but moreover also in that he placed the humerus incorrectly

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[1] The Geological Institute, Tübingen possesses a good cast of the skeleton.

in the scapulocoracoid articulation, it must be rotated by about 90° about the longitudinal axis. The radius is straight, the ulna curved, and both bones cross. At the distal end of the ulna lies a small, long carpal, probably an ulnare. In the manus (cf. pl. III(XI)) only the first three digits are preserved; MARSH restores the fourth and fifth; they were also present without doubt. It is a typical grasping manus with very strong first, weaker second, and even weaker third digit, as is best seen from the figure. The hind limb is almost twice as long as the forelimb, namely 55 to 37 cm (up to the ungual points).

Of the pelvis (pl. II(IX)), the left ilium and both pubes are present. The ilium sticks into the stone with its upper part, only the acetabular edge and both the processes are visible. Thus the outline of the ilium, particularly of the anterior spine, is unknown; I stress this. MARSH substitutes the ilium of *Ammosaurus* into his figure of the hind limbs and pelvis of *Anchisaurus*. *Ammosaurus major* is quite different from *Anchisaurus colurus*, as will be shown below. If an ilium is to be inserted into the reconstruction of *Anchisaurus*, that of *Thecodontosaurus* would probably come nearer the truth. The pubis partly recalls that of *Plateosaurus*, partly that of *Megalosaurus*. The right pubis is 18 cm long. At the proximal end the hook and the neck are almost exactly as in *Plateosaurus*, only the neck is even longer; the twisting is also as there. At the end of the neck the pubis expands to 6 cm, but then it becomes narrower again and is only 3 cm broad at the distal end. The anterior part of the pubis is not a thin plate as in *Plateosaurus* and its relatives, but it is a solid bone, in no way delicate. The cross-section at the distal end is apple-pip-shaped. The median edge is straight, the lateral has at the broadest point in the bone an outward angle, and from there distally the contour forms a concave line. The entire lower surface is covered with coarse rough muscle scars, particularly at the broadest place and at the projection of the outside. The lateral edge of the right pubis projects from the stone; rough areas are also visible here for muscle attachments. The distal end of the pubis of *Massospondylus* is also similar to this (cf. fig. 69).

The right pes is preserved complete; it is bent at a right angle downward at the knee and forward at the pes articulation. The uppermost part of the proximal end of the femur is missing; as far as it is preserved, the femur is 19 cm long, probably 2 cm should be added for the complete length. The upper end is curved strongly medially and compressed peculiarly from the front backward so that a sharp edge occurs on the lateral side, which extends from above to beside the fourth trochanter. The anterior side of the femur, and thus also the greater trochanter, stick into the stone and are therefore unknown. On his figure, MARSH copies this part of the femur from *Ammosaurus*. The fourth trochanter is a narrow, sharp ridge in the direction of the longitudinal axis; it does not possess points or edges; the lower end of the ridge lies 9.5 cm above the distal end of the femur, thus a little above half the length of the whole bone. The distal condyles are high and sharp and descend steeply toward the sides; an edge of the lateral condyle runs several cm upward on the posterior side, of the medial not. The distal end surface is placed obliquely forward and downward, thus indicating also a bent knee in the most likely extended position.

The tibia and fibula have the structure figured by MARSH. The tibia is 14 cm long, the fibula 14.5 cm. The tibia very strongly recalls that of *Thecodontosaurus*; at most it is rather more compact. On the lower end of the tibia the astragalus fits inseparably tightly; it is 4.5 cm long and medially scarcely 4 and laterally 2.5 cm broad; only its lower surface is visible. The calcaneum is a small bone, curved below, as SEELEY has figured for *Hortalotarsus*. Of the tarsals of the second row, two found *in situ* project fully from the stone; one small bone with an elongate level surface, which lies above metatarsal IV and metatarsal V, lying on its posterior side, must represent the cuboid; I have taken that lying beside metatarsal III as cuneiform III; but only very little of this projects from the stone, and of that found without doubt beside it on metatarsal II nothing more peeks from the stone. The pes is as MARSH figured it. The three middle digits are slim and strong, the first is shortened but also armed with a strong ungual; the fifth digit is rudimentary, no phalanx of it is preserved, the fifth metatarsal ends at the distal end stump-like without articular condyle; the proximal end is broad and flat; the whole bone does not reach the length of metatarsal I.

ANCHISAURUS (?) *SOLUS* MARSH. (Pl. IV(IX))

I have only one photograph of *Anchisaurus solus* available to me on which not all the parts are visible that MARSH described because these, such as e.g. the skull and tail, appear on the other side of the stone slab; thus I can hardly say any more than MARSH.

The vertebral column is preserved complete and without gap from the skull as far as (according to MARSH) the tenth caudal vertebra; the sacrum sticks into the stone. Next the forelimbs without the scapula and parts of the humerus are present, further the ischia and traces of the pubes. MARSH says of the skull: "The skull, so far as it can now be observed, resembles the one just described (*Anch. colurus*). The teeth are numerous, and inclined forward. The orbit is very large. The quadrate is inclined forward, and the lower jaw is robust. The entire skull is about 65 mm long, and the lower jaws are of the same length." On the photograph only traces of the lower jaw are seen.

Behind the head follow 21 connected, greatly elongated vertebrae, in addition to which are the atlas, nevertheless very small and not visible on the photograph, and a last presacral vertebra, making 23 presacral vertebrae as in *Anchisaurus colurus*. Of these 23 vertebrae I count fourteen as dorsal and nine as cervical. Between the ninth and tenth vertebrae there is a similar length difference as in *Anchisaurus colurus*. The cervical and dorsal vertebral column is only visible from the ventral side. The cervical vertebrae are unusually similar to those of *Tanystrophaeus*. The first five vertebrae, i.e. counted from the axis, are 8 cm long according to MARSH. The longest is the penultimate, the eighth vertebra, which is 30 mm long and 6 mm wide. The three last cervical vertebrae and the first dorsal vertebra (along with the other cervical vertebrae it is not recognizable because of the bad state of preservation) are keeled along the base, the first dorsal vertebra most strongly. The other dorsal vertebrae are not keeled below, but rounded; the eighth dorsal vertebra is 17 mm long, i.e. ca. 2.5 times longer than broad. The ribs are also extremely lightly and slimly built. Our photograph gives no information on the structure of the other parts of the axial skeleton; according to MARSH the first ten caudal vertebrae are also preserved—obviously on the other side of the stone slab. We know nothing about the sacrum. Moreover it is a remarkable fact, stated by MARSH, that the first ten caudal vertebrae combined are only 140 mm long; thus they are very short, less than half as long as the cervical vertebrae and even shorter than the dorsal vertebrae. Indeed it is the general rule in the Triassic Theropoda that the first half of the caudal vertebral series is relatively short, but a long tail with long vertebrae would also be expected in an animal with such a very long neck. This fact seems to me to be important, especially with reference to *Tanystrophaeus*[(1)].

Nothing is to be seen of the pectoral girdle, however both forelimbs are present. The humerus is short (66 mm), but in proportion to the slender vertebral column it is very strongly built, the shaft thick and the internal process broad and high. The humerus is very like those of *Thecodontosaurus* and *Anchisaurus colurus*, but here the proximal part is more broadly built than in *Anchisaurus colurus*, in particular the lateral process does not slant so much downward. The left

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[(1)] [not translated. – MTC.]

radius and ulna recall those of *Anchisaurus colurus* in their outline; they lie side by side, and the ulna is rather curved. From the photograph the length of the left ulna is 37 mm; therefore the forearm is comparatively longer than in *Anchisaurus colurus*. According to MARSH the manus has five digits; the metacarpals and phalanges visible on the photograph are very slim.

The ilia are not visible on our photograph. The ischia are the most striking of the pelvic bones; they are visible from below and seem to be found exactly *in situ*; only the two quite thick shafts are seen, which approach each other distally in a posteroventral direction. In front of the ischia, the stone covering projects considerably over the vertebral column; on this projection are recognized the remains of a plate-like bone that probably arises from the pubic plates; however nothing at all can be more closely discerned.

Both the hind limbs also seem to be present, but on the photograph only the femur and tibia of the left side can be seen to some extent. The femur is represented in medial profile view. From this I estimated the length of the femur as 120-150 mm; according to MARSH the ulna is 88 mm long. The lower end of the fourth trochanter ridge is found about 72 mm above the distal end of the bone. The distal condyles project strongly backward. The fourth trochanter has a similar profile to that of *Anchisaurus colurus*. From the tibia it can only be recognized that the shaft is thin, but the proximal end is strongly thickened and the upper articular surface stands obliquely forward and upward. According to MARSH, the pes has five digits, of which the fifth is small and rudimentary.

MARSH says that the skeletal bones are "nearly all extremely light and hollow".

Thus this skeleton has a slender vertebral column with long vertebrae in the neck and back and short vertebrae in the anterior half of the tail; the back begins with a short vertebra. The remaining skeletal bones are not as slender as the vertebrae. The humerus is very robust but also very short; in particular the forearm is also short in proportion to the upper arm; the arm offers broad attachment surfaces for strong muscles. The pes is probably twice as long. The pelvis (ischium) seems to be strong.

It is *possible* that this species belongs to the same genus as *Anchisaurus*, and thus is also an *Anchisaurus*.

AMMOSAURUS MAJOR MARSH. (Pl. V(XII) – IX(XVI))

This species, which was found in the same beds and locality as *Anchisaurus colurus*, is classified by MARSH as a typical theropod, very closely related to *Anchisaurus*. But this view was not proved. MARSH probably drew support from the structure of the pes and the length of the sacral vertebrae. I thank the late Prof. BEECHER for his kind help and excellent photographs of *Ammosaurus*. Beyond this, the material of *Ammosaurus* only consists of a few remains; the distal end of the tibia and the fibula with the astragalus and calcaneum is no longer present, although MARSH describes and figures these parts; apart from them, the material exists in one large block containing several dorsal vertebrae, the left damaged ilium and the ischia; a second with the right ilium and the upper end of the right femur; two other pieces that contain parts of the right and left pedes and the upper end of the left femur with a part of the tibia. In his reconstructions, MARSH clearly used the ilium of *Ammosaurus* for *Anchisaurus*, and probably also the upper end of the femur with its elevated greater trochanter.

Not much can be recognized of the dorsal vertebrae from our photograph (pl. V(XII)), for they can be seen from above. The three spinous processes are seen, which are nearly 4.5 cm broad and 1.5 cm thick at their dorsal edge. The vertebrae seem to be about 5-5.5 cm long. The ribs are very strong, as the figure shows best. Whether the three vertebrae are exactly the last dorsal vertebrae cannot be seen clearly, but it is probable.

The sacral vertebrae, with a fragment of the last dorsal vertebra, are only visible in ventral view (pl. I(XIII)). The sacrum consists of three vertebrae; the centra are narrow but long. The sacral ribs arise far anteriorly. The first and second sacral vertebrae are each 4.5 cm long, yet the breadth of the posterior articular surface of the second is only 2.5-3 cm, and in the middle the centrum is constricted to 1.5 cm. The first sacral vertebra is equally slim. The posterior part of the third is missing, but it gives the impression of being rather shorter. The first sacral rib runs somewhat posteriorly; it is 3 cm long; its distal end is thicker than its origin, it arises right in front, close behind the articular surface of the vertebra. The second sacral rib sticks out at a right angle from the vertebra; it is only about 2.5 cm long, its distal end is thinner than that of the first, but its origin is considerably broader and reaches to the middle of the vertebra. The attachment site is perforated by a rather large round foramen, as MARSH figured. The third transverse process is peculiarly forked and divides into lower and upper portions, the lower stronger half is the sacral rib, which bends anteriorly in an acute angle, and the ilium extends right above the postacetabular process. This sacral rib narrows in its course to a vertically standing lamella. The upper part appears as a true lateral process; it projects at a right angle from the vertebra and does not seem to reach the posterior point of the ilium. The only similar sacral rib known to me is that of *Brontosaurus excelsus* (see fig. 8).

The ilium (pl. V(XII) and VII(XIV)) is of striking structure in that the posterior spine is very much longer and narrower than usual in the Triassic Dinosauria. Since the ilium always has a characteristic form in the large groups of Dinosauria, this is a noteworthy factor. The length of the right ilium from the posterior to the anterior point is 17 cm, the height measured from the postacetabular process vertically upward is 8 cm, the width of the acetabulum is 10 cm, and its height is 4 cm. The anterior point of the ilium is 5.5 cm long and only 1.5-2 cm high at its root. The point curves rather more ventrally than the rest of the dorsal edge of the ilium. The dorsal edge is not thickened as in Orthopoda, but thin and sharp as in all Triassic Theropoda. The posterior point is rather damaged; in front of the place of fracture, which must otherwise be placed close in front of the original end, the spine is 2 cm high. It sends a small process medially that was probably joined by bands to the posterior forked piece of the lateral process of the third sacral vertebra. The postacetabular process has a triangular articular surface, one point of which is directed laterally. The notch or the acetabulum forms a decreasing curve, steep posteriorly and flat anteriorly. The postacetabular process is long and directed forward; from the anterior root of the anterior spine it is 6.5 cm long. The articular surface of this process does not have a crescent-shaped outline, as in other Triassic Theropoda, but more of a trapezoid in which the narrowest sides lie in front and the opposite long side lies behind the adjacent acute angle outside. Above the anterior half of the acetabulum the edge produced is extremely sharp and roof-like, but not nearly as strong as in *Coelophysis*. The anterior spine is very greatly thickened at its ventral longitudinal edge. Remains of the left ilium are found on the block with the dorsal vertebrae; this is, as far as I can recognize on the photograph, with the medial side twisted outward and its upper part destroyed; the two lower processes on the upward-directed process on the photograph can be seen and recognized as the posterior; the much longer preacetabular process is also recognized by the outward-turning of its articular end and the sharp edge that, starting below, runs outward from the posterior spine; this process is curved and directed downward; on the not-sharply-extended smooth edges above the acetabulum the medial side of the bone is recognized, whose posterior end therefore curves upward (on the photograph). I have described this poorly preserved left ilium in detail in its position because it could easily be taken for a poorly preserved *Anchisaurus*-type pubis, from the photograph, if some of the clearly colored stone is included (as I originally did).

On the same block, behind the dorsal vertebrae (pl. V(XII)), two long, narrow bones can be seen that are obviously corresponding parts. The longer of these pieces has a preserved length of 13.5 cm. The articular end is found on the left toward the dorsal vertebrae. This is expanded and thickened. The distal, broken-off part, in contrast to the upper flat parts, has an arched dorsal surface and probably an oval cross-section. This shaft expands proximally, i.e. toward the articular end. About 5 cm above the distal fracture surface one edge rises abruptly lamella-like and seems originally to have expanded even further, but it is broken off. The thin projecting part of the edge does not extend quite to the articular end but stops short before it; the edge in question is 3-4 cm thick ventrally from the articular end; thus a thin, flat, rather outward-curved process must have been found in the aforementioned place. The second similar bone, which is found above this, is in even poorer condition. I can identify only these two bones as ischia, certainly they differ essentially from those of *Anchisaurus*.

Two bones found above the ischia could perhaps be the proximal ends of the pubes; but their condition is too poor for this to be accepted as certain. Unfortunately we know nothing about this important part. A flat piece of bone is found in the right acetabulum that could well be a proximal fragment of the pubis.

The proximal ends of both femora (pl. V(XII), VI(XIII), VII(XIV)) are present. The upper end is strongly flattened and the head curves in considerably medially. The flattened upper surface forms approximately a right angle with the longitudinal axis of the femoral shaft. The greater trochanter lies on the lateral edge of the anterior side; it is a tuberosity as in *Euskelosaurus* or *Massospondylus* but is found much higher than in the former. The left femur is compressed and damaged, but it can be seen clearly on the right that it is found only ca. 3 cm below the 5.5 cm broad proximal end. Nothing more of the fourth trochanter is preserved.

On the left femur, and partly pushed into it, lies a bone that could be taken from the photograph for the upper end of a tibia. The bone is completely straight, the articular end only moderately thickened and flat.

MARSH figures the distal ends of the tibia and fibula but I have no photographs of them. In connection with them, to judge from MARSH's drawing, the astragalus and calcaneum are also preserved. The calcaneum is just the size of the end of the fibula; it is not high and rounded roll-like below; its anterior end recalls *Hortalotarsus*. The astragalus also has the breadth of the tibia, but it differs from the Triassic Theropoda by the position of the short rising part. This is found in the middle in front, while otherwise it is always placed laterally. From this a structure can be recognized at the distal end of the tibia different than in Triassic Theropoda. The indentation and two processes are displaced anteriorly from the side. This is also the case in Jurassic Theropoda such as *Streptospondylus* and *Allosaurus*; but these possess an ascending process on the astragalus, which is not the case in Ammosaurus; on the other hand, *Camptonotus* and *Claosaurus*, according to MARSH's figures, have the same form of the tibial and fibular distal ends and of the astragalus and calcaneum; the astragalus has no ascending process but, e.g. as in *Thecodontosaurus* or *Plateosaurus*, the anterior thicker part below the anterior process and the posterior thinner part below the posterior process of the tibia match; only here the whole distal part of the tibia with the astragalus is rotated forward about 90°. In its distal end the fibula is still relatively as strong as in *Euskelosaurus*.

The pes (pl. V(XII), VIII(XV), and IX(XVI), fig. 1) is quite completely preserved; the left lacks some of the phalanges and the right the metatarsus. There are five digits present, the second to fourth are long, the first and fifth short. Three tarsals of the second row are present (pl. VIII(XV)) which lie on the second, third and fourth metatarsals. From analogy with other forms, these are cuneiform II, III and the cuboid. They are all of similar size, whereas cuneiform III is usually smaller and the cuboid largest. In the present state of preservation, their smooth ventral surfaces are turned forward, thus probably curved about 90° backward. The metatarsals are not unlike those of the Plateosauridae. As far as can be seen in the photograph (pl. VIII(XV)), metatarsal II has a rectangular cross-section at its proximal end, retains the two anterior longitudinal edges up to the middle, and has a strong, rather obliquely placed distal articular condyle. Metatarsal I is compressed at its proximal end and is placed flat on metatarsal II; its shaft is curved in such a way that the distal articular condyle comes to lie parallel to the rest; the articular condyle is very obliquely placed and much thicker laterally than medially. Metatarsal III is longest of all; proximally it probably has a triangular cross-section; both the anterior longitudinal edges are sharp, the lateral in particular projects laterally and covers part of metatarsal IV; the distal articular condyle is only very slightly oblique and indeed in the same manner as metatarsal II; in front, above the articular condyle a clear groove is seen that approximately follows the course of a ventrally open hyperbola; it shows that the phalanx could be curved far dorsally. Metatarsal IV has a very strong laterally projecting edge at its proximal end; the distal articular condyle is oblique, but placed in the opposite sense from the others. Metatarsal V is much shorter than the rest; its proximal end is strongly compressed and has a small hook-like process laterally that extends ventrally as a right-angled lamella up to half its length. The Plateosauridae have a similar "hatchet-shaped" fifth metatarsal. This metatarsus does not differ from that of the Plateosauridae and—as far as known— the Thecodontosauridae; similarly for the phalanges. The phalanx of the first digit is naturally medially directed (pl. VIII(XV) and IX(XVI), fig. 1), but the ungual resumes the sagittal direction. This ungual is rather more curved than the others and is also rather larger. The second phalanx (pl. IX(XVI), fig. 1) of the second digit has a sharper point in front and above than the other phalanges. The unguals reduce a little in size laterally. The fifth digit (pl. V(XII) and VIII(XV)) probably has a very rudimentary phalanx; the distal end of the metatarsal is damaged; below it is found a minute elongate bone, just as in *Hortalotarsus skirtopodus*. Otherwise the pes is not noteworthy. Laterally, metatarsal I is 8 cm long, metatarsal II 12 cm, metatarsal III 14.5 cm, metatarsal IV 13.5 cm, and metatarsal V 6 cm long.

With the exception of the pes, almost no parts common to *Ammosaurus* and *Anchisaurus* are preserved. Thus it is understandable that MARSH regarded both as very close relations and initially even as representatives of the same genus. It may well have been the pes in particular that caused this, although he does not speak of it. MARSH believed that they were so closely related that he thought he could use parts of *Ammosaurus* (ilium, upper end of femur, etc.) without consideration in the reconstruction of *Anchisaurus*. The facts also do not seem to him to be contradictory, although nothing certain apart from the pes can be quoted in its favor. For all that, the more considerable size was explained as a specific and generic difference. At first I had no objections to following him in this respect, except that the ilium and moreover other features indicate a different scent which will be discussed.

MEGADACTYLUS POLYZELUS HITCHCOCK

Not many remains of *Megadactylus polyzelus* are present. They come from Springfield, Massachusetts and are preserved now in the Amherst College Museum. Present are: five vertebrae, a piece of the right manus, both ischia, parts of the left femur, the left tibia, and left fibula as well as the left pes.

COPE has described and figured these remains in most detail in *Trans. Amer. Phil. Soc.* 14:1, 1870, 122a ff., pl. 13. No detailed new description need therefore be given here, but essentially the establishment of the relations to other species and genera and the generic determination.

The dorsal vertebra, *loc. cit*. fig. 5 (see text-fig. 10; no. 5) is very long and narrow and in this respect probably recalls *Anchisaurus*; *loc. cit*. fig. 6 (see text-fig. 10, no. 6) is interpreted as an anterior caudal vertebra, but I think it is a sacral vertebra, perhaps the first, for it differs strongly in its structure from the anterior caudal vertebrae and recalls instead the dorsal vertebrae by the length of its centrum. The two caudal vertebrae in fig. 7 (see text-fig. 10, no. 7) belong to the beginning of the tail, however they are not the very first because haemapophyses are already present. The spinous processes do not seem to be particularly broad (they are damaged). The sides of the second of these vertebrae are nearly flat and the underside seems to meet the side in an edge. The transverse processes were thick but are broken off now. Finally, nothing noteworthy is to be observed in the last small caudal vertebra, fig. 8 (see text-fig. 10, no. 8).

The right manus exists in better preservation (fig. 10, no. 9). The distal ends of the radius and ulna are not quite close together. The ulna is stronger than the radius. Between the radius and metacarpal I and II two carpals are recognized; the smaller lies on metacarpal II and thus probably represents the trapezoid; whether the larger is a trapezoid, radiale or intermedium is hard to determine, but I think the last is most probable. Of the digits, the first and second are complete, but only three phalanges of the third are present and the ungual phalanx is missing; the nearest metacarpal, set slightly apart, I hold for the fifth from analogy with European Theropoda (cf. *N. Jahrb. f. Min*., Beil.-Bd 19, 1904, 330, fig. 10). Between this and the preceding digits three small phalanges are apparently found that could well belong to the fifth digit from their position; it is possible that the first member represents only the distal fragment of metacarpal IV and the two following are only the first two phalanges of this digit; in *Thecodontosaurus* from Bristol in particular, metacarpal IV is very delicate and thin.

The shafts of both ischia, *loc. cit*. fig 10 (see text-fig. 10, no. 10), are preserved complete. They are very thick and short, of triangular cross-section in their distal part and also thickest there. A similar ischial shaft is preserved from *Massospondylus*, only larger (cf. fig. 53). Other pelvic bones have not been found.

Three pieces of the left femur have been found. It is probable that COPE has assembled them as on his fig. 1 at the correct distances, only I would have placed the proximal piece rather more medially directed opposite the middle piece. The femur thus shows a strong S-shaped curvature, the proximal end is flattened, and the head directed rather more strongly medially (fig. 10a). The ridge of the fourth trochanter is rather angularly broken in its longitudinal direction and in this recalls *Thecodontosaurus* from Bristol (at least one of the species). The distal end with its high condyles is also similarly built, but at the same time recalls *Massospondylus* not much less. The greater trochanter on the anterior side is found midway between the proximal end and the lower edge of the fourth trochanter.

Of the lower leg we have the proximal end of the right tibia and a proximal and a distal part of the left fibula with a metatarsal (fig. 10, no. 2, 3, 4). The upper end of the tibia is very strongly thickened as in *Thecodontosaurus*; the outline of the upper articular surface is also long and obliquely extended as there. The upper end of the fibula is very reminiscent of specimen No 63 of *Thecodontosaurus* in the Bristol Museum, the upper edge is obliquely and sharply turned outward.

The shaft of the bone seems to be straight; the distal end is rather thickened and shows a projecting edge posteriorly. This part recalls specimen No. 5 in the Bristol Museum (*Thecodontosaurus*).

In the same block of stone as the fibula, metatarsal IV is connected to it but turned upward, and above it is a tarsal, the cuboid from its position. The pes of *Hortalotarsus,* described by SEELEY, is similarly pulled upward, probably caused by spasmodic contraction of the muscles at death. This metatarsal is clearly thickened at the upper end, the shaft is straight, the distal articular condyle sends a process out to one side, which also continues somewhat upward. The small bone between fibula and metatarsal is probably the cuboid and not the calcaneum.

All bones an thin-walled and hollow.

These bones have about similar size to *Anchisaurus colurus* and MARSH also held *Megadactylus* for another species of *Anchisaurus*. But the differences from *Anchisaurus* seem to me to be larger than those from *Thecodontosaurus*; the dorsal vertebrae are certainly elongated as in *Anchisaurus*. More in favor of affiliation to *Thecodontosaurus* are the femur with its probably high-placed fourth trochanter, the form of the tibia and fibula, then also the radius and the slender metacarpals. The anterior caudal vertebrae also seem to have narrow spinous processes like *Thecodontosaurus*, whereas *Anchisaurus*, according to MARSH, has broad spinous processes.

COELOPHYSIS LONGICOLLIS, BAURI, AND *WILLISTONI* COPE
Pl. X(XVII), fig. 2 – XII(XIX), fig. 1

These three species were first described by COPE in 1877, the first two in *Amer. Naturalist*, 22, 367-369 as species of the genus *Coelurus*, then in the same year these two and *C. willistoni* as belonging to the genus *Tanystrophaeus* in *Proc. Amer. Phil. Soc*. 24, no. 126, 209-228[(1)]. Unfortunately these remains have never been figured. Therefore it was impossible for me to form a definite picture of these bones despite the description; so I asked Prof. OSBORN of New York to send me casts of the originals, which he very kindly did. Unfortunately not all the originals could be found again, but those present are enough for the purpose of reviewing the genera. Of the bones described by COPE, only the ischium of *C. longicollis* is now missing; only a dorsal vertebra and the sacrum of *C. bauri* are present and nothing at all of *C. willistoni*.

Neither cervical nor caudal vertebrae show morphological similarity with the well-known long vertebrae of *Tanystrophaeus conspicuus* H. von MEYER from the German Muschelkalk. They are no more elongated than the corresponding vertebra of *Anchisaurus colurus*.

Descriptions and measurements are detailed in COPE. For all that, a short description will follow here because some things can be improved and COPE's works are not always readily accessible.

Among the vertebrae of *C. longicollis* are one cervical vertebra, one dorsal vertebra and two caudal centra. The axis is in very good preservation (pl. X(XVII), fig. 2). The centrum is 63 mm long; the posterior round articular surface is rather deeply concave, the anterior shows an upper projecting, broad, weakly concave surface and a lower flat surface, inclined obliquely backward. This surface has two sharp angles ventrally; they serve for articulation with the atlantal intercentrum; the upper projecting part with the slightly concave surface serves either for articulation with the atlantal centrum or—as seems most probable to me—it meets the atlantal centrum as the axis odontoid process itself, as in e.g. *Ceratosaurus nasicornis* MARSH (*loc. cit*., pl. 9, fig. 2). The axial centrum is constricted in the middle, but it is thickest at ca. one-third of the

[(1)] In 1889 COPE established the new genus *Coelophysis* for these three species in *Amer. Naturalist*, 23, 625-626.

length from the anterior articular surface, so that the arch of the lower profile line descends rapidly and steeply in front. Rather anterior to the middle, the centrum is sharpened ventrally; posteriorly it is rounded ventrally and in front, flattened ventrally for a bit with sharp edges at both sides. The neural arch is flat and constructed very broadly in front. In place of the transverse process in front is found a broad, obliquely ventrally directed ridge (pl. X(XVII), fig. 2b, right); a small carpal is exposed between it and the wall of the neural canal (pl. X(XVII), fig. 2a, left). An obliquely forward and dorsally directed strut from the posterior articular surface combines, somewhat posterior to the middle of the vertebra, with the backward-sloping fold that passes into the postzygapophysis. The attachment of the spinous process is only 30 mm long; it is broken off. Other cervical vertebrae are not present, but it can probably be assumed with certainty that the longest of them, in the posterior half of the neck, reached or exceeded 8 cm. The just-described axis does not have the slightest similarity with *Tanystrophaeus*, but agrees in general form with cervical vertebrae of *Anchisaurus* or *Thecodontosaurus* and *Coelurus*.

Unfortunately not much is preserved any longer of the dorsal vertebra (pl. X(XVII), fig. 3), only the centrum. The centrum is 42 mm long and the posterior articular surface 20 mm high, yet it is constricted to 9 mm in the middle (fig. 11). The vertebra is twice as long as broad; the middle of the transverse process lies 30 mm above the ventral edges of the articular surfaces. The neural canal is high and 6 mm broad.

The two caudal vertebrae show a very elongated form. These are probably what caused COPE to combine the genus originally with *Tanystrophaeus*(1). The neural arches are missing. One (pl. X(XVII), fig. 4) is 51 mm long and 23 mm and 10 mm high. The articular surfaces are scarcely noticeably concave. In the larger one the neural canal is round in cross-section and 6 mm in diameter. True transverse processes are not present, however both possess long projecting longitudinal ledges on the sides; they are more highly developed in the smaller one. The larger vertebra has distinct haemapophyseal facets.

Among the vertebrae of *C. bauri* it a dorsal centrum (pl. XI(XVIII), fig. 3) that is 30 mm long and 14 mm high; the species is smaller than *C. longicollis*. The form of the centrum is if anything even more delicate than the foregoing.

The sacrum and the last dorsal vertebra of *C. bauri* are also preserved (pl. XII(XIX), fig. 1). The sacrum consists not of four vertebrae, as COPE said, but of three; the most anterior vertebra is a dorsal. These four connected vertebrae are rather flattened ventrally, however without showing lateral edges. The length of the last dorsal vertebra is 20 mm, the first sacral vertebra 19 mm, the second also 19 mm, and the third 16 mm.

Therefore it is likely that the first caudal vertebrae were shorter than the dorsal vertebrae and that subsequent caudal vertebrae then became long again. The attachment of the transverse process of the last dorsal vertebra is a thin, almost vertical lamella (parapophysis) that only widens above. The three sacral ribs are all placed anteriorly on the centra, the first is bent forward, the second and third backward; the first and second have a broad, transversely placed attachment ventrally on which is built a vertical lamella, finally widening above once again; the third sacral rib extends dorsally similarly. This is very similar also in the European *Plateosaurus*. In the second sacral vertebra the neural arch is preserved up to a height of 30 mm.

Three parts of the manus of *C. longicollis* are preserved. From the description of *Ornitholestes* by OSBORN it is possible to decide with certainty that the manus was built very similarly. I believe one piece is the distal end of metacarpal III (pl. X(XIII), fig. 9), the other is the first phalanx of the second digit (pl. X(XVII), fig. 7), and the third piece is part of the ungual

(1) COPE holds the *Tanystrophaeus* vertebrae specifically for caudal.

phalanx probably from the first digit (pl. X(XVII), fig. 6); but I cannot say whether these pieces belong to the right or left manus. Only 3 cm of the metacarpal are preserved, but one can estimate an original length of at least 6-7 cm, perhaps more; at the place of fracture, the shaft has a triangular cross-section with 9:8 diameter. The distal articular condyle has a sagittal diameter of 18 mm and only 10 cm transversely in the middle; thus it is very narrow and clearly expanded from the front backward; the probable median side is flat—thus the bone comes from the left manus, if this assumption is correct—here also the collateral pit is barely indicated, but on the opposite, probably lateral, side it is deep, and behind it the bone projects asymmetrically quite far backward. The articular condyle itself extends more backward than forward. The first phalanx was thus more frequently directed backward than forward (anterior side = palmar side) and generally could not be curved far forward. It is certain from this that the manus was not intended for locomotion, but for grasping prey alone and thus built just like the manus of *Ornitholestes*(1) and *Ornithomimus*(2).

The complete phalanx (pl. X(XVII), fig. 7) does not fit on the just-described articular condyle; the concave deepening at the proximal end too short in the sagittal direction; thus it must come at the nearest from the third digit. It is 43 mm long; it is very narrow and also rather asymmetrically built; on one (probably medial) side the collateral pit is absent, it is present on the other and likewise a strongly projecting edge is found behind at the proximal end.

The fragment of the ungual phalanx (pl. X(XVII), fig. 6), which must probably come from the first digit, is unusually strongly curved, very thin and very high. A small piece of the two-part, longitudinally keeled proximal articular surface is preserved; this shows a rounding of very small radius of the preceding articular condyle. Accordingly I reconstruct the ungual phalanx with the preceding phalanx in the manner shown in fig 13.

There are parts of right and left ilia present. The former is probably that described by COPE as No. 2 of *C. longicollis* (pl. X(XVII), fig. 10). COPE holds them for two different species but I do not think sufficient grounds are produced for this. On the ilium the broad roofing-over of the acetabulum is conspicuous at once; this bone lamella is curved ventrally and at this point the dorsal edge of the acetabulum is ca. 3 cm broad. The acetabulum is up to half closed. The pre- and postacetabular processes are very broad, but not particularly thick. Besides, COPE confused anterior and posterior; the surface of the ischial articulation is triangular, larger, and at the same time convex; the surface of the pubic articulation is concave and has a sigmoid outline. The whole upper half of this ilium is missing, but the posterior spine with the medial crest of the left ilium is preserved; this was probably regarded by COPE as a fragment of the piece described as No. 2 (pl. X(XVII), fig. 9) although it comes from the left side.

The posterior spine reaches clearly far posteriorly, for both dorsal and ventral edges run almost parallel for 3 cm. Behind, the point is vertically cut and this edge is 3 cm long; the angles are right angles. The ventral edge is curved slightly downward. Thc lateral surface is barely noticeably convex. On the medial side beside the ventral edge a high, vertically attached, ca. 5 mm thick ridge is recognized, the inferior crest of the ilium (on which the distally expanded sacral ribs rest astride, as is observed in many other Triassic Theropoda) (fig. 16).

According to COPE's description, the ilium of *C. willistoni* differs clearly from that just described by its more widely open acetabulum, much less projecting supraacetabular crest, and remarkably small size.

I have not been able to obtain casts of the ischia; parts of those of *C. longicollis* and *bauri* were present. According to COPE, the ischial shafts are not fused, but form a long symphysis. The

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(1) *Bull. Amer. Mus. Nat. Hist.* 19, 459-464.
(2) *Ottawa Naturalist*, 18, 1904, 33-36, pl. 1 and 2.

distal end is rather expanded; at the proximal end the articular surface for the ilium is rather concave and the acetabular edge runs from here obliquely ventrally, exactly as in other Theropoda.

The right pubis (pl. XI(XVIII), fig. 2) of *C. longicollis* lies before me as a cast; the fragment of *C. bauri* does not. The structure of the pubis reminds me most of *Coelurus*(1). The pubis is a 228 mm long, thin, rod-shaped bone that is bent rather downward. At the proximal end the bone is broad and thick and the medial edge twisted ventrally; the twisting begins 7 cm in front of the proximal end; the surface of the latter is finally vertical, and the proximal end is 5.7 cm broad and 2 cm thick. The articular surface (fig. 18) fits exactly on that of the ilium. In the middle of the pubis the thickness of the lateral edge is 8 mm; the medial edge is damaged along its entire length; it is only a few mm thick and originally extended even further medially as a surface. The distal end is strongly thickened for 23 mm at the lateral edge, but the thickening is only 9 mm broad. This thickening recalls the shoe-shaped process in *Coelurus, Ceratosaurus, Allosaurus,* etc. The length of the pubis is striking: it is even rather longer than the femur! Probably no other conclusion can be drawn than that of COPE and MARSH, who assume that the ends of the pubes served as points of support in low crouching.

The femur (pl. XI(XVIII), fig. 1) is very thin and narrow; it is 21.5 cm long. A particularly characteristic feature is the strong curvature of the head. This part is damaged. As far as preserved the curvature measures 3 cm. The femoral shaft is scarcely noticeably bent and expands only distally from 17 to 30 mm diameter. The greater trochanter is a strong ridge or rather edge in the place where the curvature of the head begins. Almost nothing is preserved of the fourth trochanter, for the femur is damaged just here and is obviously restored with plaster, however without allowance for the trochanter, only the lower end of the ridge can be detected; this is found 7 cm below the proximal end of the whole bone. The distal condyles are not very strongly developed (fig. 19); the medial is the higher, and from the distal end of the lateral condyle an edge extends another 40 cm proximally; on the lateral side of this condyle no indentation is found as in other Triassic theropod femora.

COPE says about the proximal end of the tibia of *C. bauri*: "The head of the tibia is trilobate posteriorly. The outline is anteroposteriorly sigmoid, the spine turning outward and forming an acute angle. From this apex both borders are strongly sigmoid, the external commencing with concavity, the internal with convexity." From this description and with the measurements given in a table, an approximate outline can be easily reconstructed (cf. fig. 20).

B. SOUTH AFRICA

EUSKELOSAURUS BROWNI HUXLEY

This genus and species from the South African Upper Karoo of Aliwal North (Stormberg beds) was founded by HUXLEY (1886) in *Quart. Jour*. 23, 1-6, although without figures. The remains are those still preserved in the British Museum and redescribed here. In the same work, HUXLEY founded the genus *Orosaurus*(1) on a supposed distal end of a femur without specific determination. In 1889, LYDEKKER in *Geol. Mag*. 6, 353 changed this name to *Orinosaurus* (because of the similar *Oreosaurus*) with the addition of the specific designation *capensis*. As will be shown in the following, *Orinosaurus capensis* is probably a tibial fragment from *Euskelosaurus*,

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(1) cf. MARSH, *loc. cit.*, pl. 10, fig. 3, 4.
(1) Not to be confused with *Oreosaurus*, a genus established in 1862 by PETERS for a living lizard species.

and thus the genus *Orinosaurus* must be cancelled. The second half of the skeleton sent to HUXLEY or MURCHISON was sent by Mr. BROWN from Aliwal North to the Muséum d'Histoire Naturelle, Paris; these parts (pubis, vertebrae, etc.) were described by P. FISCHER without name in *Nouvelle Archive du Muséum d'Histoire naturelle de Paris*, 14, 1870, 163-200, pl. 10 and 11. Later SEELEY summarized these remains (without *Orinosaurus*) in *Ann. Mag. Nat. Hist*. 14, 1894, 317 ff., redescribing them briefly and giving some figures; he also referred to a dorsal and a caudal vertebra in the Albany Museum, Penhoek, South Africa and to several pieces that Mr. BROWN sent to him.

I will not go into the ca. 40 cm long jaw fragment, which SEELEY has described, for not as much can be recognized from the photograph as SEELEY describes, and this part cannot be used for comparative purposes because too few maxillae have been found.

A single (fig. 21) poorly preserved cervical centrum (British Mus. no R.2802) is present; however SEELEY described it as a caudal vertebra, *loc. cit.* p. 326; it is 15 cm long and 7.5 cm broad on the inner articular surface. I am absolutely sure that the vertebra that SEELEY described as a cervical (*loc. cit.* p. 339, fig. 7) is not a dinosaur vertebra (it bears no. 2791) but a theromorph cervical vertebra; I need only mention the shortness and the facets for the intercentrum among other things. No Triassic theropod has short cervical vertebrae.

The dorsal centrum described by SEELEY is 11.5 cm long, the breadth at the barely concave articular surface must measure 16 cm, the height more; below, the vertebra is rounded; elongated depressions are found on the sides. The neural arch is missing.

In Paris there are four so-called caudal vertebrae, but I hold the first of them for the third sacral vertebra (figs. 23 and 25). The sacral vertebra, of which only half is present, and the first caudal vertebra (figs. 23 and 24) are sharpened below. The first three caudal vertebrae are each 13 cm long; the centra are 15-16 cm high. The first caudal vertebra bears no haemapophysis, the others probably do. The haemapophysis of the second vertebra is curved backward, and the following one is straight and directed backward (figs. 26 and 24); the apple-pip-shaped perforation is 7 cm long. Otherwise these vertebrae have been figured sufficiently. The first caudal vertebra has a 9 mm diameter (?nutrient) foramen somewhat below the transverse process. The transverse processes have considerable thickness, particularly in the first caudal vertebra. The ventral edge of the third sacral rib is found only 7 cm above the ventral edge of the vertebra; it is a very massive attachment. Also the spinal processes of these anterior vertebrae must have been relatively narrow and high; in the third its breadth, measured at the damaged place on the postzygapophyses, is only 7 cm. An isolated spinal process is found in the British Museum (no. 26), but it seems to belong to a dorsal vertebra for it is very broad.

The other remains preserved are a pubis, several femoral, tibial and fibular pieces, and part of the pes.

The pubis (fig. 30) was well figured by FISCHER (*loc. cit.* pl. 11, fig. 15), but he did not interpret it correctly; SEELEY (*loc. cit.*) describes the pubis in detail, but holds it for a left, but it comes without doubt from the right side, as I could establish with certainty from the large European zanclodont material. The bone is 61 cm long and of the usual structure of Triassic Theropoda. The lateral edge is thick, particularly in the proximal part, and distally the whole bone is plate-shaped; only the distal edge is thickened again and certainly mostly from the middle downward. The edge is pitted and rough, as if it had been covered with cartilage (fig. 30e). The pubis is relatively broad and strengthened by two longitudinal folds on the underside (fig. 30c). The pubic subacetabular process is short and twisted outward as usual; the acetabular surface displays a broad, sigmoid, outward-opening cavity (fig. 30d), which as a rule is rather smaller in the European Zanclodontidae.

Among the *Euskelosaurus* material in Paris there is a distal end of a left pubis of approximately similar size, but which differs from that just described by the form of the edge thickening and thus may perhaps belong to another species (fig. 31).

Three fragments of the femur are present: one is the shaft of a right femur, but which lacks both ends; another is the upper part of a right femur from the fourth trochanter to the greater trochanter; and the last is the distal end of a rather larger femur that may not belong to the same species. The large femur piece (fig. 32) is 65 mm long, and the complete size cannot have been much over 70 cm. The shaft is barely noticeably S-shaped. The lower edge of the fourth trochanter is found quite far below the proximal end, namely ca. 40 cm, i.e. far below the middle of the whole bone. The ridge of the fourth trochanter is broken off here, but it is present in the fragment in fig. 33 and seems to be symmetrical and a weakly arched curve in profile, which is raised only about 2.5 cm above the remaining upper surface; the ridge is 14 cm long, thus considerably less than the broken-off surface on the large piece. The greater trochanter, an angular knob on the anterior side, is found 15 cm below the (present) proximal end. 16 cm below the greater trochanter a 10 mm diameter foramen can be seen, which is interpreted as the nutrient foramen (fig. 33a) and which is always found in this place in Triassic Theropoda. The greater trochanter does not stick out from the shaft as sharply as SEELEY figured it (*loc. cit.* fig. 4). The proximal end is strongly bent over medially. At the distal end of the large piece the beginning of both folds that run toward the condyles can just be recognized (fig. 32a). The third rather larger piece (fig. 37) shows the outline of the distal articular surface (really it is a cross-section through the bone close above this articular surface). The broad channel between the condyles is seen along with the very high and strongly laterally turned over sharp ridge of the lateral condyle; the bone is 20 cm wide at this end. At the distal end of the femur piece is also seen that this expands downward; at the broken-off point it is only 15 cm broad. Certainly the breadth of the third named 22 cm long distal piece (fig. 37) is the same at both ends; therefore it is almost certain that it comes from another species; but it cannot be identical with the species preserved in the Vienna Hofmuseum because the condyles are built entirely differently. The piece in question in the British Museum bears the No. R.1626, the same as the so-called *Orinosaurus*, whereas the other *Euskelosaurus* material is labeled No R.1625.

Of the tibia there is a left proximal end (fig. 29) and a right (fig. 34) and a left (fig. 35) distal end with the corresponding fibular pieces adhering to the two former; in addition there is the femur named *Orinosaurus* (fig. 36). The articular surface of the proximal end of the *Euskelosaurus* tibia (fig. 28) is damaged; its longitudinal diameter is 20.5 cm, its transverse diameter behind, 14 cm. The anterior point is broad and strongly curved laterally; the lateral side is deeply indented, the medial symmetrically curved. About 20 cm below the proximal end the shaft is only ca. 12 cm thick; the anterior point projects very strongly forward. The distal end of the tibia (fig. 35) is unusually built in that the posterior edge is considerably longer than the anterior end (16/10 cm on the left tibia), a characteristic that is otherwise known to me from only one Triassic dinosaur (*Gresslyosaurus robustus* HUENE from Bebenhausen near Tübingen). The distal end of the tibia expands toward the thin shaft suddenly and strongly, particularly on the lateral side. Thus the tibia is very like that of *Gresslyosaurus*, only I do not know any such small species.

The bone taken for the distal end of a femur that has been named *Orinosaurus* is no more than the proximal end of a large tibia. The piece is completely compressed and thus appears even larger. The posterior condyles are strongly developed. It may be recognized that the proximal end was elongated (perhaps ca. 18 cm broad and ca. 24 cm long). This tibia is larger than that just described of *E. browni*, and it is naturally possible that it belongs to a separate genus, but one must have definite characteristics to be certain of this. Therefore it is best to leave this species in *Euskelosaurus* for the time being; I should also like to combine the large femur distal end (fig. 37) right away with this species and would thus temporarily name these two pieces *Euskelosaurus capensis*. Both these pieces are the only ones of the series that are labeled No. 1626, whereas all others bear No. 1625; thus probably both these pieces of the left limb were found together and separate from the rest.

The proximal end of the left fibula (fig. 29) still adheres to the side of the tibia. It is 14 cm broad and 5 cm thick behind and only 2 cm in front. The most anterior lowest part forms a wing-like process; with the exception of this process (which is flat), the outside is curved. The proximal end is very like the fibula of *Gresslyosaurus robustus* from Bebenhausen. This distal end of the right fibula (fig. 34), which is still *in situ* together with the tibia, is distinguished in particular by a forward, laterally directed process almost exactly like *Gresslyosaurus plieningeri* HUENE of Stuttgart and Poligny. The shaft is compressed, its larger diameter is 6 cm, at 10 cm above the distal end, the smaller scarcely 5 cm, and at the lower end itself the anteroposterior diameter is 7.5 cm.

The astragali are still stuck *in situ* onto both tibiae. The right is rather damaged (fig. 34), the left (fig. 35) not. The form is shoe-shaped as usual, symmetrically curved below, long and low, but nevertheless placed transversely; an ascending process is not present.

In Paris there are still preserved three tarsals of the second row connected to a small piece of metatarsal (fig. 38); FISCHER (*loc. cit.*) has figured them but could not interpret them with certainty. From a comparison of these with the European Triassic material and the tarsus of *Allosaurus* from the Como Beds, of which the Tübingen museum has photographs and casts, I think I may be permitted to presume that these three bones are cuneiform II and III and cuboid of the left pes together with a proximal piece of metatarsal II. A figure and the naming of the tarsals is sufficient here, for a description is of little value without connection with other tarsals; I will come back to this elsewhere in comparison with the European material. It may only be said that the tarsus appears different in the genera *Gresslyosaurus*, *Plateosaurus* and *Teratosaurus*, although with slight similarities.

I will not go into more detail on the phalanges (fig. 10) described by SEELEY and which I have not seen; I will only say that they are very short and compact and indicate a heavy, short pes.

EUSKELOSAURUS (?) sp. Pl. IX(XVI), fig. 2 and Pl. X(XVII), fig. 1.

In the Vienna Hofmuseum several dinosaur bones from the Upper Karroo of South Africa (Stormberg beds) are found with the label: Coll. BROWN 1876. Thus it seems that the same Mr. BROWN who sent the *Euskelosaurus* remains to London and Paris also sent these latter to Vienna.

The pieces considered here are a proximal end (pl. X(XVII), fig. 1) and a distal end (pl. IX(XVI) fig. 2) of a left femur. The proximal end is flattened and the head is right-angled medially. Here the breadth is 21 cm, while the shaft is only 14 cm broad close below the head. The lesser trochanter shows as a weak broad ridge, placed obliquely on the upper posterior edge. The shaft is only 7-8 cm thick close below the head. Already 13 cm below the proximal end, the point of the greater trochanter lies rather laterally on the anterior side. The greater trochanter (fig. 41b) is a ca. 10 cm long ridge along the longitudinal axis of the femur, which slopes rather backward and terminates above quite abruptly, but without a true “point”. On the posterior side of the femur the fourth trochanter is also found high above, which can be named really a pendant trochanter in this case (fig. 41a) for its point is placed slightly downward. The ridge is 15 cm long, and the lower end lies 12 cm below the upper end of the femur. The ridge is very thick and slopes rather medially; it begins proximally with a gradual rise until it reaches a height of 5 cm in the middle, then it drops off a little downward and ends with a point hanging slightly downward. It lies on the medial side of the bone and its decrease forms a level surface with this. This femur fragment is only 35 cm long; the middle of the shaft is missing. This is the only large femur known to me from the Triassic with a trochanter situated so high up, for it must be assumed that the bone was ca. 90-100 cm long; the pendant form of the trochanter is also not otherwise known in the Triassic. If I name this femur provisionally "*Euskelosaurus*" sp., despite the fact that it belongs to another genus than *Euskelosaurus browni* HUXLEY, it is because I do not think a new genus should be based on a single, not even complete, bone. As soon as better skeletal parts are found, the generic characteristics will become more precisely defined.

The distal end of this femur (fig. 42) has a breadth of 26 cm, but 20 cm higher it is only 14 cm broad. Both condyles project strongly; the medial is hemispherical and ends with a steep descent above; the lateral, thick, ridge-shaped one is turned outward and also ends abruptly with rather a steep descent, but a shallow fold runs upward even further from its upper end. Between both condyles is found a deep, ca. 3 cm broad groove. The bone is 18-19 cm thick at the lateral condyle. The distal articular surface is rather curved and covered with pit-like roughenings. The form of the distal condyles precludes identity with *Euskelosaurus browni* and *E. capensis*.

MASSOSPONDYLUS CARINATUS OWEN Pl. XIII(XX), fig. 6 to Pl. XVI(XXIII).

The remains belonging to *Massospondylus* were described in detail by SEELEY, but were very insufficiently figured. If it is done again briefly now, it is essentially for the sake of completeness, and also to provide good figures and a few improvements.

As SEELEY says (*Ann. Mag. Nat. Hist*. 15, 1895, 102-118) at the beginning of his description, these bones were found in 1853 in the region of Harrismith (Beacon Hill, NW of the Beaucherf House farm) in the Drakensberg, South Africa. In 1854 they were sent to the Royal College of Surgeons, London. R. OWEN described them then briefly and without figures in the "Descriptive Catalogue of the Fossil Organic Remains of Reptilia and Pisces contained in the Museum of the Royal College of Surgeons of England" London 1854, 97-100. Here, without detailed evidence, they were split into three genera: *Massospondylus carinatus*, *Pachyspondylus orpeni*, and *Leptospondylus capensis*. They belong to two or three different large individuals of one species, for which SEELEY has established the name *Massospondylus carinatus*.

Massospondylus carinatus agrees to a great extent with the European *Plateosaurus*, but in the limbs has much similarity with *Thecodontosaurus*; in size it stands between the two.

The cervical vertebrae are elongated and the posterior ones keeled ventrally as *Plateosaurus*. The best preserved is No. 331 (pl. XIII(XX), fig. 6 and text-fig. 43); I believe it is about the eighth (of thirteen); the keel is distinct, the parapophysis and diapophysis are not even so strongly developed as they must be in the last cervical vertebrae, the zygapophyses are extended far anteriorly and posteriorly with oblique articular surfaces, the spinous process is short, low and thin. No 333 is the posterior half of an anterior cervical vertebra (pl. XIII(XX), fig. 8) and No. 332 is the neural arch of a similar one (pl. XIII(XX), fig. 7). These anterior cervical vertebrae are very elongated and drawn out thinly in the middle; these pieces could belong to the fourth through sixth cervical vertebrae. SEELEY thinks (*loc. cit*. p. 106) that they could belong to another species, but no grounds exist for that at all, for in the articulated vertebral columns of *Plateosaurus* examined by me, the vertebrae of the particular regions are built almost identically and are similar to each other as are the vertebrae of the different regions in *Massospondylus*. No. 335 is a posterior cervical centrum (ca. tenth–twelfth) with a strong keel (fig. 44).

The centrum of the most anterior dorsal vertebra (fig. 45) is easily recognizable by the extraordinarily high, sharp keel of the underside; the centrum of No. 334, in two pieces, is only 2 cm thick in the middle with a height of 4.5 cm.

The centrum No. 337 is characterized by the flattened underside (fig. 46) as a fourth through sixth dorsal vertebra. All other dorsal centra come from more posterior regions; there are four of them: No. 336 (pl. XIII(XX), fig. 9), No. 348, and two without numbers. In No. 336 the length-to-height ratio is 7.5 cm. In the middle the vertebrae are constricted and the underside is rounded. Neural arches are not present; only the attachments of the struts are seen in front and behind.

Centrum No. 346 (pl. XIV(XXI), fig. 1) is a single, but noteworthy, small sacral vertebra. The length is only 5 cm, the breadth 4.5 cm, and the height 3.5 cm. This vertebra must have come from a smaller individual than most of the other vertebrae; I hold it for the second sacral vertebra. The underside is rounded but with a trace of sharpening. The sacral ribs are broken off; their attachment occupies three-fifths of the length; it reaches deeply downward. No trace of the neural arch is present.

Nos. 338-345 (pl. XIV(XXI), fig. 1c) and 347 (pl. XIV(XXI), fig. 3) and four without numbers (fig. 47) belong to the tail. The anterior caudal vertebrae are very short and high, e.g. 4 cm long and 6 cm high. Even further forward is No 338 (pl. XIV(XXI), fig. 2), with a centrum 6.5 cm long and high. This latter has a very strong transverse process, even somewhat supported from below; thus it must be one of the most anterior caudal vertebrae; but because it possesses a haemapophysis facet ventrally on the posterior articular surface, it is probably not the first but the second. In the remaining anterior and middle caudal vertebrae, the transverse process has a flat, elliptical cross-section. The anterior caudal vertebrae are broadly rounded ventrally, the ones following are sharpened keel-like ventrally and have a posteroventral groove that is even rather indented into the haemapophysis surface (fig. 47a). The middle and posterior (cf. pl. XIV(XXI), fig. 5) caudal vertebrae become larger again, but they reach no more than the length proportion of the cervical vertebrae.

Of the forelimb we have scapula, humerus and parts of the manus. SEELEY has confused the scapula with the ischium. Nos. 349 and 350 probably belong to the same scapula (pl. XIV(XXI), fig. 8 and 9), and No. 359 is the proximal end of a smaller scapula (fig. 49); both from the left. No 357 is likewise the proximal end of a left scapula. The scapula is thin and slender, and is distinguished by a high, wing-shaped process upward on the articular end; the coracoid half of this process (fig. 48) is thin and concave laterally, just as in *Plateosaurus*, only even stronger; the medial side of the wing process is flat. The distal end expands again and is notched obliquely upward on the posterior edge. The whole bone is hollow. The thickened articular end curves medially. Below, the articular surface for the humerus is noticed, which cuts into the bone as a curve. It is set off with an edge from the coracoid articular surface, which runs directly upward.

Nos. 354 and 356 are proximal and distal ends of the right humerus (pl. XIV(XXI), fig. 6 and 7). The proximal end is broad, the upper edge runs obliquely downward toward the lateral process which clearly moves toward the edge, but is not turned forward as strongly as in many other Triassic Theropoda. The humeral head lies on the medial, rather backward-directed angle and is thickened posteriorly; similarly the highest place of the upper end is also thickened posteriorly. The distal end is broad and shows strong, forward-directed condyles.

The manus remains can be determined from the numerous and complete manual skeletons of the European *Plateosaurus*, etc. The right metacarpal I (pl. XVI(XXIII) is an extraordinarily compact, broad, short bone; the length of the lateral side is 5 cm, of the medial 3.5 cm. Thus the articular condyle is oblique. The proximal end surface (fig. 61a) is triangular. The anterior and posterior edges are 4.5, the lateral edge 3.5 cm long; the rounded tip runs medially. The sharp anterior lateral edge extends up to the articular condyle, the posterior is short and ends above the latter. The articular condyle (fig. 61b) is 4.5 cm long and has a maximum diameter of 2 cm; the collateral pits, particularly on the medial side, are strongly developed; the articular condyle is rather constricted in the middle; it extends forward and backward far upward so that the phalanx has very great mobility, perhaps rather more backward (palmar) than forward. The same bone of *Teratosaurus* is most similar to this, however *Pachysaurus* and other European groups are similar as well.

I believe No 381 is the distal half of the right pollex phalanx (fig. 62). The diameter in the middle of the phalanx is 2.2 cm. Both collateral pits are large. The articular condyle is divided by a deep groove into 2 pads; the main part of the articular surface is directed backward; the lateral part of the articular condyle projects more strongly and has a steeper surface; accordingly the ungual phalanx must have been directed medially in extended position, but in flexion the ungual is moved laterally towards the other digits by this arrangement. The same is attained by the oblique position of the articular condyle in the metacarpal, only to a much greater degree. This arrangement produced opposability of the pollex, really necessary for the grasping manus, but absent here.

I considered No. 383 (fig. 63) as a right pollex ungual. The articular surface fits on the just-described phalanx. The ungual phalanx is very high at the proximal end (4 cm of which 3 cm is articular surface), strongly compressed and sharply pointed; without the missing point it is 6 cm long. The articular surface is asymmetrical with a narrow lateral and broader medial surface that meet roof-like.

I believe the small ungual phalanx No. 385 (fig. 64) is that of the third digit; it is only 3.5 cm long and 2 cm high. The size ratio of the unguals is the same as in *Gresslyosaurus robustus* HUENE from Bebenhausen.

Phalanx No. 379 (fig. 67), from analogy with *Plateosaurus erlenbergensis* HUENE from Stuttgart, seems to me to be the first from the second digit of the right manus. It is 4 cm long. The upper articular surface is simply concave, the distal articular condyle is barely noticeably furrowed in the middle; the medial collateral pit is more strongly developed than the lateral. A crescent-shaped cavity is found in front and above the articular condyle that indicates that the second phalanx had a long point in front and above, as is always the case in *Plateosaurus* and *Gresslyosaurus*; in this point the second phalanx of the second digit is usually recognizable at first glance. The phalanx is asymmetrically built, in that the median longitudinal edge is sharper in front, the lateral behind. The articular condyle allows greater flexion of the second phalanx backward than forward. Piece No. 377 and one without number are the same phalanges of the left and right mani; in the latter block the point of the second phalanx is also present.

The fifth metacarpal of the right manus is still present as No. 366 (pl. XVI(XXIII), fig. 6). It is a very thick, compact, short bone. It is only 3.2 cm long. The short shaft is 1.7 cm thick. The upper articular surface is strongly elevated and thickened on the wall-like edge; the highest place is found on the median side and falls off steeply from here. The greatest breadth above is 3 cm. The articular condyle is curved forward, backward and laterally, but not medially. Metacarpal V in *Plateosaurus* is built similarly, only perhaps rather less compact.

If these manual bones are dealt with in more detail it is because SEELEY did not do so in his description. Parts of three bones of the pelvis are preserved. No. 358 is a left ilium (pl. XV(XXII), fig. 1) that lacks only the preacetabular process. The anterior spine is sharp but short; the posterior spine long and rather broad. The dorsal surface is curved medially in the middle. The edge above the acetabulum does not project so strongly roof-like as in many other genera. The interior crest on the inside of the posterior spine is present for better attachment of the sacral ribs, but it is not strongly developed.

As shown above, SEELEY holds two pieces of scapula for parts of the ischium. Nos. 353 (fig. 52) and 386 (fig. 53) are without doubt pieces of the ischium. SEELEY did not mention the former, the catalogue calls it "coracoid of *Pachysaurus*"; the latter is listed in the catalogue as the lower jaw of a gavial, and by SEELEY as "large chevron-bone of an undescribed Saurischian". The former is a proximal part of the left ischium, the latter a piece of the two fused ischial shafts. The ischium is built after the type of *Plateosaurus*. The thickened posterior edge bears a longitudinal groove in the middle, which disappears again in the shaft itself; the shaft has a triangular cross-section. The proximal end expands forward lamella-like and at the same time curves outward. Upper and anterior edge are not preserved.

Nos. 351 and 352 belong to the pubis as proximal ends (fig. 51); the latter is about one-quarter smaller than the former. Besides these SEELEY knew two unnumbered pieces that complete No. 351 subacetabularly (fig. 69). The proximal end is bent in an acute angle and provided with a hook-shaped process that possesses an outward-open sigmoid pit on the acetabular surface. The neck of the pubis is flat and sharp; the twisting occurs there. The expanded middle and distal part of the pubis seems thin, but the lateral edge and particularly the distal edge seem to be thickened, as is the case in *Plateosaurus* and *Gresslyosaurus*.

Pieces Nos. 360 and 362 are from the right femur (pl. XV(XXIII), fig. 2; pl. XVI(XXIII), fig. 1 and 2 and text-fig. 54), and No. 361 is from the left. The middle with the greater trochanter is unknown. The femur is slim and curves slightly anteroposteriorly. The proximal end is curved moderately medially and at the same time the head twists rather posteriorly. The lesser trochanter scarcely appears. On the anterior side the greater trochanter is raised as a broad ridge; its highest place is 9 cm from the proximal end. The femoral head is 11 cm broad, the neck above the greater trochanter 7 cm, the thickness in the latter place 4.4 cm. The distal piece of the right femur must be broken off very close below the fourth trochanter because a minimal sharpening of the surface can be recognized at the posterior fracture edge, as it can only be near to the fourth trochanter; from here to the distal end the femur measures 20 cm; if 1.5-2 cm are added up to the lower end of the fourth trochanter, 6 cm for the ridge of the trochanter and ca. 6 cm for its upper edge (placed on the others) to the greater trochanter, rather less than from here to the proximal end, this would give an overall length of ca. 43 cm. SEELEY comes to the same result. The distal condyles project strongly posteriorly; the lateral is sharpened and slopes toward the side, an edge runs a further 8 cm proximally. The articular surface is sloped rather obliquely anteroposteriorly corresponding to the tibia, whose articular surface is sloped posteroventrally, which in an upright position gives a bent knee (of about 30°).

Of the tibia we have a right proximal end (pl. XV(XXIII), fig. 5) and a left (Nos. 363 and 365), and a left distal end (N. 364 (fig. 53 and 70). The proximal articular surface is bordered by a convex line medially and an S-shaped one laterally; both meet in a point anteriorly; the posterior edge between the condyles is notched. The lateral edge is 9.5 cm long, the medial 11 cm and the greatest posterior breadth is 7.5 cm. Below the tuberosity (the anterior point) the tibia is deeply indented on both sides (fig. 70). 15 cm below the proximal end the shaft has diameter of 5 by 3.5 cm. The distal end (pl. XV(XXII), fig. 4) is compressed anteroposteriorly; the anterior side is 6 cm broad up to the point of the anterior process; the medial surface is directed in a very acute angle obliquely laterally and is 4.5 cm broad; the posterior side is less than 4 cm broad and the points of the process are also only 4 cm apart. Different parts of the pes are present:

Nos. 367 and 370. Proximal end of left metatarsal II.
No. 369. Proximal end of right metatarsal II.
No. 373. Distal end of right metatarsal II.
No. 368. Distal end of right metatarsal III.
Nos. 371 and 372. Distal end of right metacarpal IV.
No. 375. First phalanx of the right second digit.
No. 378. First phalanx of right fourth digit.
No number. Second phalanx of the right second digit.
No. 382. End phalanx of the right first digit.
No. 384. End phalanx of the right first digit.

I will say only a little about these. Nos. 370, 373, and the unnumbered piece come from a small individual, the others from at least two large ones. The proximal end of metatarsal III is distinguished by its rectangular outline; in front the edge projects more strongly above the shaft than behind, and the anteromedial longitudinal edge is sharper than the lateral. The articular condyle of this metatarsal is directed obliquely laterally forward and projects more strongly laterally. The articular condyle of metatarsal III is not oblique and is rather thicker medially. The distal end of metatarsal IV has a particularly broad, obliquely forward-opening collateral pit laterally. The first phalanges are characterized by the uniformly concave proximal articular surface, those of the second digit by the deep groove that divides the articular condyle into two pads, which is not the case in the first phalanges of the other digits; the lateral collateral pit is the larger, thus right and left may be determined. The first phalanx of the fourth digit is distinguished by a rather obliquely laterally-upward directed articular condyle. The second phalanx of the second digit is easy to recognize by the sharp point in front and above, it is directed somewhat medially. The ungual phalanges of the pes differ from those of the manus in that they have asymmetrical form; the cross-section (fig. 68b) shows this most clearly; the lateral side meets the underside with an acute angle, the medial with an obtuse angle; thus the ungual lies on the ground obliquely with a laterally directed point; the ungual of the first digit is the largest.

The *Thecodontosaurus*-like tibia in particular shows me that *Massospondylus* cannot be united with *Plateosaurus*. The scapula, ilium, pubis, and femur differ from *Thecodontosaurus*, and the manus is built far more strongly.

HORTALOTARSUS SKIRTOPODUS SEELEY AND *MASSOSPONDYLUS BROWNI* SEELEY.
(Pl. XXI(XIX), fig. 2 to pl. XIII(XX), fig. 5)

In 1894 SEELEY described the parts of the right pes of a small dinosaur, remaining after the destruction of a complete skeleton, as *Hortalotarsus*. The only remains preserved in connection are the tibia, fibula, tarsus, fourth and fifth digits, impressions of the second and third, and a small fragment of the femur (pl. XIII(XX), fig. 1).

The tibia is 20 cm long. The proximal articular surface is elongated and the point curved laterally as in *Thecodontosaurus* from Bristol. Certainly the posterior condyles are damaged so that the outline of the articular surface cannot be compared exactly. The medial edge is convex and higher than the lateral; the point is also curved high; behind it the lateral edge is indented; the lateral condyle is much nearer the point than the medial. In its present condition the proximal articular surface is 5.6 cm long, but at least 6 cm originally. The shaft has barely over 2 cm diameter. The distal end is expanded in transversely and the posterior edge measures 3 cm, the anterior ca. 3.5 cm and the median 2.5 cm; the contour forms an acute angle at the anterior median angle. At the proximal end the thickened posterior part projects more strongly over the shaft than the anterior so that the proximal end seems to be inclined posteriorly.

The femur fragment adheres to the median condyle. The femur was bent at more than a right angle from the tibia; the median condyle is characterized by its lower surface. The condyle is 2 cm broad and 1 cm high reckoned from the intercondylar fossa. Its lower surface is strongly curved and the fossa continues as a shallow groove on the lower articular surface.

The fibula lacks the uppermost proximal end, ca. 3 cm. It is bent weakly laterally. The upper end is compressed, flat medially and curved laterally; the cross-section is 11:18 mm on the fracture surface. The distal end expands and is obliquely compressed anteroposteriorly.

The tarsus (fig. 71) is very good; astragalus, calcaneum, cuboid and a piece of cuneiform III are present. The astragalus is 4.2 cm long and 2.2 cm broad medially; it is rounded below, curved more steeply anteriorly and flatter posteriorly. The posterior edge is sharp; the height difference between the posterior and anterior medial edges is 7 mm; the height difference between the anterior and posterior processes of the tibia must be the same also.

The calcaneum is of exceptionally fine appearance. From the Triassic it is actually only known from *Anchisaurus colurus*, but it is not so clearly visible there as here. It does not recall *Hallopus* or Crocodylia, but is a true dinosaur calcaneum as e.g. in *Allosaurus*. In sagittal diameter it measures 2 cm on the transverse side and 1.5 cm on the medial. The underside is ball-like. On the lateral side it tapers off suddenly from the front and forms a point. The calcaneum does not extend as close to the astragalus as in *Anchisaurus*, or even more in *Allosaurus*.

On the anterolateral edge of the astragalus sits a tiny bone that could perhaps be an intermedium. I have not been able to observe such a bone in any other specimen.

Below the fibula and on metatarsal IV and V lies a small bone, the cuboid. I believe the visible surface is the ventral; it is 2. 8 cm long, medially it is 1.3 cm broad and laterally 7 mm; a ridge is raised above it that however begins 9 mm from the medial end. The cuboid of *Plateosaurus poligniensis* has exactly the same form. In *Anchisaurus colurus* it can only be recognized as a long, small bone.

On metatarsal III sits a smaller bone but only a small part of it is preserved. This cuneiform III is also smaller than the cuboid and flat in *Plateosaurus poligniensis*.

The pedal bones, no less than the tarsus, recall *Plateosaurus*, but at the same time also *Thecodontosaurus* from Bristol. The length of the phalanges is exactly that of *Thecodontosaurus*. Metatarsal V is hidden behind metatarsal IV; it is only 4 cm long, whereas the former is 8.5 cm. Metatarsal III is 10 cm long; it is partly preserved only as an impression. Only a part of the impression of metatarsal II is preserved. The fifth metatarsal is provided with a single small phalanx, which is only 1 cm long. This piece is poorly preserved and so it remains undetermined whether another joint follows or not.

At the end of his description of *Hortalotarsus* SEELEY emphasizes particularly the similarity with *Dimodosaurus*, i.e. *Plateosaurus poligniensis*; but this is a more generalized species. Only incidentally and without returning to it later he says of the tibia: "In general form and size the bone resembles *Agrosaurus* and, in a less degree, *Palaeosaurus*." It is just this similarity with *Thecodontosaurus* (or *Palaeosaurus* SEELEY) that seems most obvious and particularly important to me and even greater than the similarity with *Plateosaurus*. The form of the tibia is completely characteristic of *Thecodontosaurus*; the long laterally curved point at the proximal end, the lateral condyle moved far anteriorly at the proximal end (pl. XII(XIX), fig. 6 and text-fig. 81), and the type of thickening of the proximal and distal ends only occur elsewhere in *Thecodontosaurus* and *Anchisaurus*. The astragalus also corresponds exactly to that of *Thecodontosaurus* from Bristol. I see no evidence for separating *Hortalotarsus* from *Thecodontosaurus*. Before going into this further, I will discuss

MASSOSPONDYLUS BROWNI. SEELEY has described both femora, two cervical vertebrae, one dorsal vertebra, three caudal vertebrae, and several pedal bones; he is uncertain if they belong together but it is very likely. They come from the Stormberg Beds of the Telle River, not far from Aliwal North. SEELEY places them with reservations in *Massospondylus*, but he says it is not impossible that they belong to *Hortalotarsus*.

The femora (pl. XII(XIX), fig. 7 and 8 and text-fig. 86 and 85) are distinguished by a strong S-shaped curvature as well as by the compressed distal end and the sagittal groove that divides the articular surface. Elsewhere the articular surface is usually broader than deep; here both measurements are the same. The whole femur is strikingly strongly compressed sideways, thus e.g. the transverse diameter close below the fourth trochanter measures 2.5 cm, the sagittal 3.5 cm. The complete length of the femur is 24 cm, the fourth trochanter lies with its distal end 11 cm below the proximal end of the bone. The femoral head is strongly curved and very thick; the lesser trochanter appears only very indistinctly as a broad, flat elevation. The small femur piece on the pes of *Hortalotarsus* recalls this femur strongly in that the sagittal groove (on pl. XIII(XX), fig. 1, not recognizable) of the distal articular surface seems to be present similarly as here, but naturally no certain conclusion can be formed on such a fragment.

The more complete of the two cervical vertebrae (pl. XIII(XX), fig. 3 and text-fig. 72) is 6 cm long and its centrum is 2 cm high. The anterior half of the next vertebra posteriorly is still in connection with this. With SEELEY, I considered the former as the axis; at its anterior articular surface it is 2.2 cm broad; the second is 2.9 cm broad at its anterior articular surface, thus showing a rapid increase in size of the vertebrae posteriorly. Both are keeled ventrally in the anterior half, rounded ventrally in the posterior. The anterior articular surface of the axis is not so well preserved that the attachment surface of the odontoid process can be recognized. The postzygapophyses project extraordinarily far laterally, as is also the case in the axis of *Plateosaurus quenstedti* HUENE. A lamella extends like a web between them.

A dorsal vertebra described by SEELEY (pl. XIII(XX), fig. 2 and text-fig. 73) cones from the most anterior dorsal region. This can be recognized from the high, posteriorly curved transverse processes and the low-lying parapophysis facets as well as the very narrow, compressed centra, rather flattened ventrally; the lateral indentations, which the middle and posterior dorsal vertebrae have, are missing. The transverse process is supported by a strong strut that runs first ventrally, then to the posterior edge of the vertebra; a very fine, narrow fold passes dorsally from the parapophysis. The anterior strong strut runs back above the parapophysis to the root of the prezygapophysis. *Thecodontosaurus* of Bristol has vertebrae of exactly the same form, in particular the struts of the transverse process are built very similarly; in fact complete agreement does not exist with any of the Bristol vertebrae because none of the pieces there comes from the same region; No. 16, a middle dorsal vertebra, is most similar.

Further, several distal caudal vertebrae were described by SEELEY that I have not seen, and which are not very important for the generic determination and comparison. From the description they could easily fit *Thecodontosaurus*.

Also, for the pedal remains which I have not seen, I refer to SEELEY's description, only I cannot agree with him on the phalangeal number that he ascribes to the separate digits; thus e.g. the third digit cannot possess five, but only four phalanges; the phalanges found must certainly come from more than one individual.

Next I may describe some vertebrae and skeletal parts that also seem to belong here. They are preserved in the Vienna Hofmuseum. The label reads: '"Karoo-formation, Südafrika. Coll. ADLER 1886." The remains consist of five dorsal vertebrae, parts of three humeri, eight femora and a tibia piece, as well as a not definitely determinable bone piece.

Among the vertebrae is one that really agrees completely with that of *Mass. browni* (pl. XIII(XX), fig. 4 and text-fig. 76); only if the former was the third, then this must be the fourth, for it is still rather strongly flattened ventrally. The transverse processes also project dorsally here and stand higher than the postzygapophyses. The base of the spinal process is very short, as in anterior dorsal vertebrae. The centrum is 3.5 cm long, the articular surfaces 2.5 cm high and 2.2 cm broad. Without doubt both vertebrae belong to the same species.

Two other vertebrae, 3.7 cm long, are posterior dorsal vertebrae, probably also of the same species. Only the centrum of one is present (pl. XIII(XX), fig. 5). Its articular surfaces are 3 cm broad and 3.5 cm high. The centrum is broadly rounded ventrally and indented above in the middle of the sides. The articular surfaces of the other of these two vertebrae (fig. 16) are also 3 cm broad; the height cannot be measured, for the lower edge is damaged, but it seems to have been similar. The neural arch is considerably lower than in the anterior vertebrae. The broken-off left transverse process shows exactly the same features in cross-section as *Thecodontosaurus* of Bristol; in the contour of the cross-section the dorsal surface curves anteroventrally, one strut is placed directly anteriorly, the other strut more posteriorly. The prezygapophyses are directed dorsally and rather isolated as in *Thecodontosaurus* of Bristol. The base of the spinal process is moved rather posteriorly. I cannot distinguish these three vertebrae found in Vienna from *Thecodontosaurus antiquus*.

Two other vertebrae (fig. 82 and 83) are much larger, namely 5 and 5.5 cm long. One is 3 cm high, the other 4.5 cm. They are middle (height 3 cm) and posterior (height 4.5 cm) vertebrae of a larger animal, and probably another species than the foregoing. I will not venture to decide whether the markedly small sacral vertebra of *Massospondylus carinatus* belongs together with these.

The humerus (pl. XII(XIX), fig. 2, 3 and 4 and text-fig. 77 and 78) agrees completely with that of *Thecodontosaurus* of Bristol. The proximal edge is bent at an angle, the highest place is found near the medial side; the long lateral part of the proximal edge runs obliquely downward. The lateral process projects strongly and does not reach halfway down the humerus. It is likely that the lateral process is removed with its upper end by re-entrant angle from the lateral edge of the humerus, but this very edge is rather damaged. The distal end is very broad: 5.5 cm. The medial edge is strongly concave. One left humerus is complete and the proximal and distal halves of another are preserved. The middle with the lateral process of a third right humerus is present.

The femur piece (pl. XII(XIX), fig. 5 and text-fig. 80) is the distal part of a hollow left femur, which is very strikingly reminiscent of *Thecodontosaurus* from Bristol. Both condyles are very high and separated from each other by a deep groove; the ridge of the lateral one turns rather outward. The distal articular surface is not split by a sagittal furrow as in "*Mass.*" *browni*. This femur is also somewhat curved both laterally and posteriorly. 11 cm from the distal end, where it is broken off, clear mediolateral compression is seen. As in *Thecodontosaurus* of Bristol, the medial condyle is bent obliquely medially. I also cannot distinguish this femur from *Thecodontosaurus,* as already with some vertebrae above.

The tibia (pl. XII(XIX), fig. 6 and text-fig. 81) is the proximal part of a left tibia. The upper articular end is distinguished by strong mediolateral compression, lateral indentation beside the anterior point, and the far anterior position of the posterior lateral condyle; the articular surface stands obliquely posterolaterally and the whole proximal part projects especially posteriorly above the shaft. These are characteristics that we have learned of similarly in *Hortalotarsus* and that this also has in common with *Thecodontosaurus* of Bristol.

Another peculiar small bone (fig. 79) belongs to this series, which I cannot determine with certainty; I find it striking that two identical things are found in the *Thecodontosaurus* bones in Bristol. The end surface distantly recalls a femoral head; it is long, curved, projects with an end over the thinner shaft and is rather curved on both sides, but in particular a small projection is found on the more strongly thickened side. This surface is 4.3 cm long and 2 cm broad at the thickest place. The shaft, 5 cm from here on the fracture surface, has 2 by 1.7 cm cross-section; its form is trapezoid. I can place such a bone nowhere else in the skeleton than at best at the distal end of the ischium. I am not very sure of this determination because no complete ischium is present in *Thecodontosaurus* of Bristol, and because the distal end of the ischium appears different in *Plateosaurus* and its closer relatives. Also I do not think that this bone can be identified as a femur or humerus in other reptiles; thus I provisionally retain the mentioned identification.

I will now discuss how the just-described bones are distributed among the species.

The two tibiae (*Hort. skirt.* and that in Vienna) are very similar to each other, only the Vienna specimen is rather larger (articular surface longer by 1 cm); otherwise I find no difference. Because these tibiae disagree with those of *Thecodontosaurus antiquus* and on the other hand the vertebrae (with the exception of the two large ones), humerus, and femur of the latter agree almost completely with those found in Vienna, so I also suggest the identity of this with the *Hortalotarsus skirtopodus* so similar to *Thecodontosaurus antiquus*; I also count the vertebrae of "*Mass.*" *browni* here. Because no generic difference from *Thecodontosaurus* can be found, it will be best to unite this species with *Thecodontosaurus* and name it in future *Thecodontosaurus skirtopodus* SEELEY sp.

The two femora of "*Massospondylus*" *browni* belong, as shown above, to another species than the foregoing bones; I can also find no essential difference in these from *Thecodontosaurus* and thus I name them *Thecodontosaurus browni* SEELEY sp.

Whether the two large dorsal vertebrae in Vienna belong to a larger individual of the first or second species or to another must remain temporarily undecided. I name them *Thecodontosaurus* sp.

C. DINOSAURIA (?) OF INDIA

Besides the teeth of *Epicampodon* (= *Ankistrodon*) *indicus* and *Massospondylus hislopi* and *rawesi,* which HUXLEY and LYDEKKER describe (see above), LYDEKKER figures (The Reptilia and Amphibia of the Maleri and Denwa Groups. *Mem. Geol. Surv. India,* I, pt. V, pl. 4-6) several remains of which one can be doubtful whether they belong to Theropoda or Parasuchia. I do not think the ungual pl. 4, fig. 4 is dinosaurian. The phalanges pl. 4, fig. 5, 6, 7 and 8 are also not dinosaurian; fig. 8 is probably from *Belodon* or *Parasuchus*. The vertebra pl. 5 fig. 4 is probably one of the most posterior cervical vertebrae or most posterior dorsal vertebrae of a large dinosaur like *Euskelosaurus*; it reminds me most of *Gresslyosaurus robustus* from the Keuper of Bebenhausen near Tübingen; it is very unlikely that it belongs to a parasuchian. The other vertebrae figured there are partly parasuchian, partly rhynchosaurian. It is doubtful whether the teeth figured on pl. 6 are dinosaurian or parasuchian. These teeth and *Epicampodon* come from the Triassic Maleri Group, although LYDEKKER thought at first that they might be from the Lameta Group (= Cretaceous) of Maleri.

I regard these possible dinosaur remains as very doubtful and they are not considered in the summary.

D. AUSTRALIA

In 1891 SEELEY described a few bones from Australia as *Agrosaurus macgillivrayi*. The old label reads: “Fly, 1844, NE coast of Australia.” Thus they were found by Mr. MACGILLIVRAY in 1844 on the expedition of the “Fly” in an unknown locality on the NE coast of Australia. To conclude from the bones the beds must be Triassic, but they are no more closely known.

The remains lie in a grey breccia full of bone chips; the bones are preserved white. The stone is very reminiscent of the bone breccia of Durdham Down, Bristol. There are present a complete left tibia, the proximal end of a right tibia (fig. 87) and, in a block of stone, the distal end of a right radius, an ungual phalanx and a tooth, unnoticed by SEELEY.

The left tibia (fig. 86) is 20 cm long. The proximal end is built similarly to *Hortalotarsus* and *Thecodontosaurus* of Bristol, thus obliquely placed, sloping posteriorly, with elevated lateral curved points behind which an indentation follows laterally, and with an anteriorly displaced lateral condyle. The articular surface is 5 cm long and it is 8 cm broad at the lateral condyle. The shaft is thinner than in *Hortalotarsus* and *Thecodontosaurus antiquus*. At the thinnest place, the bone layer is chipped off; without this the diameter is only 1.35 cm there, but with this probably originally 1.8 cm. On the lateral side of the shaft, ca. 5 cm below the articular surface, is found a very small nutrient foramen. The distal end is again strongly thickened, the breadth in front is 3.5 cm, behind 3 cm, and medially 2.8 cm. Thus the distal end is relatively rather thicker than in *Thecodontosaurus skirtopodus*.

The radius fragment (fig. 88), which SEELEY calls a fibula, is only 5 cm long; the distal articular surface is quite level and has diameter 2.5 cm by 2 cm; on the upper fracture surface the radius has a 1 cm diameter; the bone wall is only 1.5 mm thick here. By comparison with the bones in Bristol, this piece was determined certainly as a radius. On the ulnar side of the radius at the distal end is found a beaked, sharp projection, and the whole radius curves rather forward (dorsal side of manus); right and left may be distinguished easily by this way.

In the same block of stone is found an ungual phalanx (fig. 89), however which is longitudinally broken through. The point is missing. It is 27 mm long and 17 mm high at the proximal end. Whether this represents a manual or pedal ungual can hardly be decided, for the outer surface is not visible.

In the same block of stone a tooth still sticks beside the ungual (fig. 90). Unfortunately it is badly damaged. It is 8.4 mm long and 3.3 mm broad at the base. It is compressed and rather curved; on the curve inside the edge is extremely finely serrated. Under the magnifying glass the edge serrations show as long sharp points that stick out at right angles from the edge and are crowded close together; in 1 mm there are seven such serrations. This tooth differs greatly from the teeth of *Thecodontosaurus antiquus*, in that not only the tooth form but also the serrations differ considerably there.

The tibia differs from *Thecodontosaurus skirtopodus* by greater breadth of the proximal end and by the thickness of the distal end. In any case there are two separate species but, from the structure of the tibia, both belong to *Thecodontosaurus*. Tibia and radius differ by thinness of the shaft from *Thecodontosaurus antiquus*. Thus we have to name this species *THECODONTOSAURUS MACGILLIVRAYI* SEELEY sp. The not insignificant difference in the teeth does not imply a generic difference.

III. THE GROUPING OF THE SPECIES

After finding our way through the numerous species and genera, only the following six genera and fourteen species remain:

Euskelosaurus browni HUXLEY,	South Africa
Euskelosaurus capensis HUXLEY,	South Africa
Euskelosaurus[1] sp.,	South Africa
Massospondylus carinatus OWEN,	South Africa
Thecodontosaurus skirtopodus HUXLEY,	South Africa
Thecodontosaurus browni SEELEY,	South Africa
Thecodontosaurus sp.,	South Africa
Thecodontosaurus macgillivrayi SEELEY,	Australia
Thecodontosaurus polyzelus HITCHCOCK,	North America
Anchisaurus colurus MARSH,	North America
Anchisaurus (?) *solus* MARSH,	North America
Coelophysis longicollis COPE,	North America
Coelophysis bauri COPE,	North America
Coelophysis willistoni COPE,	North America
Ammosaurus major MARSH,	North America

If this list is compared with the long one on p. 4, this result implies an essential simplification compared to hitherto. It shows, e.g. that the worldwide distribution of the genus *Thecodontosaurus* was first known from Europe and now occurs in all parts of the earth, even Asia (if *Epicampodon* from India is reckoned with it). *Euskelosaurus* stands very near the European *Gresslyosaurus* and *Pachysaurus* and shows the possibility of direct communication between Europe and South Africa by some route or other (not more precisely known). America differs most from other parts of the world, namely by the genera *Anchisaurus*, *Coelophysis* and *Ammosaurus* but indicates the possibility of the exchange by the presence of the genus *Thecodontosaurus*.

Now as for the classification of the genera into families; firstly *Euskelosaurus* appears which belongs in the European group of Plateosauridae. *Thecodontosaurus* forms the midpoint of another family. Since *Thecodontosaurus* is more widely distributed and in particular, less specialized than *Anchisaurus*, the family would be better called Thecodontosauridae; *Anchisaurus* also belongs here and *Massospondylus* is better connected to *Thecodontosaurus* than *Plateosaurus*, as we have seen above.

Only small forms belong to the Thecodontosauridae, in contrast to the large Plateosauridae (Zanclodontidae). The morphological differences are not very great. The Thecodontosauridae have slightly or even considerably longer vertebrae. The proximal end of the tibia is completely different: the articular surface is longer and narrower in the Thecodontosauridae, the anterior point much more prominent and the anterior half of the lateral edge more deeply indented, further the posterolateral condyle is moved further anteriorly than in the Plateosauridae and the whole surface is placed more obliquely posteromedially than in these. The skull in the Thecodontosauridae (only the occiput of *Thecodontosaurus antiquus* and *Anchisaurus colurus* on the one hand and *Plateosaurus erlenbergensis* HUENE present for comparison) differs from the Plateosauridae by the

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[1] "*Euskelosaurus* sp." (found in Vienna) is completely uncertain in its systematic position.

long, rod-shaped pterygoid process of the basisphenoid, in which they are short, compact and directed laterally.

Coelophysis differs very markedly from these families. COPE incorporates *Coelophysis* in the Coeluridae and I might follow him in this. Not only the hollowness of the bone points in this direction but also the whole skeletal structure. Let us select the pelvis. Already the length of the pubis, which exceeds that of the femur, is unknown in the Plateosauridae, and is also considerably smaller in the Thecodontosauridae, as far as is known. But in particular the form of the pubis head is not so decidedly hook-shaped as in the former, in such a way that the expansion of the pubis neck predominates by far, as in *Coelurus*, *Compsognathus*, and *Ornitholestes* and that only a very small hook is found in the broad neck and head; this must be broken off in *Coelophysis longicollis*. The whole pubis is curved as in *Coelurus* and the distal end again thickened as in *Ornitholestes* and *Compsognathus*, however not so strongly as in *Coelurus* in which MARSH even distinguishes a separate interpubis. The medial plate-like expansion of the pubis is thin and not so broad as in *Plateosaurus* and in this respect also recalls *Coelurus* and its relatives. This medial part of the pubis is reduced more and more not only in the Coeluridae, but also *Megalosaurus* and its group. Just as in the pubis, we find great similarity in the ilium with *Ornitholestes* in particular. The very short and broad pre- and postacetabular processes are characteristic of both; as a result the aperture of the acetabulum is also much smaller than in the Plateosauridae and Thecodontosauridae. This feature is so characteristic that it is sufficient for empirical family determination; the far backward hollowed-out ilium posterior spine is also typical of the Coeluridae. But certain differences of the ilium of *Coelophysis* from that of *Ornitholestes* are not important for the assessment, e.g. the dimensions of the preacetabular process in *Coelophysis* stand about midway between those of *Ornitholestes* and of *Thecodontosaurus* on the other hand; i.e. *Coelophysis* has not diverged so far from the most primitive Theropoda as the late Jurassic coelurid *Ornitholestes*. The form of the posterior spine in C*oelophysis* recalls *Thecodontosaurus* even more than the Coeluridae. We have already seen above that the manus was built like that of *Ornitholestes* and *Ornithomimus*—thus Coeluridae; the manus of *Compsognathus* is very elongated also. In the Thecodontosauridae and Plateosauridae the manus is also adapted for seizing prey, but it is much stronger and shorter and differs easily from these. The metatarsus is also very elongated as in the Coeluridae. There are three sacral vertebrae as opposed to four in *Ornitholestes* and probably also in *Compsognathus*, thus more primitive. Thus we recognize in *Coelophysis* a primitive representative of the family Coeluridae, specialized for swift preying; they begin in the Triassic, extend into the Upper Cretaceous and divide into different branches [(1)].

Finally, the classification of *Ammosaurus* offers many difficulties. Its pes, from the metatarsus is completely typical of Theropoda as it is known, e.g. from *Plateosaurus* (*Dimodosaurus*) *poligniensis*. On the other hand, not one theropod has such a low, long ilium with such a low, long anterior spine; otherwise only the Orthopoda have such a one and it is certainly a characteristic feature of them, which not one theropod or sauropod—to my knowledge—has. The Jurassic and Cretaceous Theropoda have a broad, rounded and partly far projecting anterior spine. The Sauropoda are distinguished by an upward crescent-shaped high ilium, which no expert could

[(1)] In *Ornitholestes* the femur is longer than the tibia, in *Coelurus* and *Compsognathus* shorter. *Ornitholestes* has relatively short cervical vertebrae, however hardly shorter than *Compsognathus*; on the other hand *Coelurus*, *Thecospondylus*, *Calamospondylus*, and *Aristosuchus* have extraordinarily elongated cervical vertebrae. *Coelurus* has an "interpubis," which the others lack (*Ornithomimus* also lacks it). But the hollowness of the skeleton, simple structure of the dorsal vertebrae, huge prezygapophyses of the middle and posterior caudal vertebrae, form of the ilium, pubis and ischium, build of the pes and manus (fangs in *Ornitholestes* and *Compsognathus*) are very similar in all of them.

ever confuse with that of an orthopod or theropod. The Triassic Theropoda still do not have such a broad and large anterior spine as the later ones, but quite short points that, however, always point rather downward and are also broader than in any other Orthopoda; thus they cannot be confused either. If we compare the ilium of *Ammosaurus* with Orthopoda we find that the acetabulum is usually flatter than here, but which connects with the femur structure; because of the flatter acetabulum, the two lower processes are also usually shorter, particularly the posterior. In *Ammosaurus* the acetabular aperture is certainly flat, but both processes are as long as is usual in Triassic Theropoda, but in these the posterior process is directed more downward than here; in the Orthopoda the upper edge of the ilium is thickened curved and turned over outward; neither is the case in *Ammosaurus*; indeed one recognizes clear muscle attachment places, but the thickening is missing. The posterior point of the ilium in *Ammosaurus* is also longer than in most Orthopoda; among the Jurassic forms *Nanosaurus* has the longest posterior point, but it is also the oldest of them; rather long posterior points are known in *Camptosaurus* and *Claosaurus* among the Jurassic Orthopoda. The ilium of *Nanosaurus* is most like that of *Ammosaurus* in every respect; according to MARSH, *Nanosaurus* comes from the Lower Jurassic, but according to WILLISTON's recent view it may even be Triassic. This comparison of the ilium of *Ammosaurus* with other dinosaur ilia suggests to me that *Ammosaurus* could belong to the Orthopoda.

In order to complete this comparison, the other pelvic bones must be examined first of all. The pubis was most characteristic but this seems to be completely missing. In the description above we have learned of two corresponding bones that we have called ischia. Now it is of value to study the ischium in the oldest known Orthopoda. It is not known from *Nanosaurus*. S*celidosaurus* is described from the Lower Lias of England as the oldest Orthopod. I now looked through R. OWEN's work on this and at the same time referred to ZITTEL's *Handbuch*; I found nothing on ischium or pubis in OWEN but in ZITTEL the note: Ischium and pubis short. Thus I saw that these parts must be present but OWEN did not recognize them. Therefore I asked Dr ANDREWS of the British Museum for a photograph of the parts in question, which he readily produced and I thank him for it here. Both ischia are present. The ischium of *Scelidosaurus harrisoni* is a rod-shaped long (33 cm) bone with thin (3.3 cm) shaft, but broader (11.4 cm) proximal end that is clearly thickened in the articular place; a thinner wing-like process runs obliquely forward in front of the articular place; the upper contour of this process forms a line concave toward the bone from the articular facet on; this therefore projects somewhat over the process. The named articular place has to insert in the postacetabular process of the ilium, and the wing-like process of the ischium is the subacetabular part extending toward the pubis. But someone may perhaps object that this bone is certainly no ischium but the pubis which sends a rod-like process backward to the ischium in orthopod fashion. A glance at the outline or the bone shows that this objection is not opposed. The criterion for ischium or pubis is then the obturator foramen or incisure. It would have to be visible in such a well-preserved pubis. A very thin place of the bone is in fact recognizable; it lies below the articular place and continues toward the upper end of the wing-like process, whereas the bone is quite thick backward from the articular end. Can this thinning, which is possibly even a perforation—it cannot be definitely recognized in the photograph—be an obturator foramen? This is completely impossible because the obturator foramen must be found on the upper edge behind the articular region: it always lies below the acetabulum and cannot move to the anterior part of the pubis. Because both ischia also lie close together when found *in situ* in the correct position in the skeleton, an inversion of the bone (so that we have the inside of a left, instead of the outside of a left bone, which could then certainly be the pubis) is as good as impossible. Thus it is a left ischium and we now compare this with that of *Ammosaurus*.

The more clearly visible of the two ischia (see pl. V(XII) and p. 17) of *Ammosaurus* is either the inside of the left or the outside of the right; the latter is more likely. The broken-off thin wing-process would be the subacetabular. This ischium stands midway between that of a Triassic theropod and that of *Scelidosaurus* in that the anterior expansion of the ilium is much broader than in *Scelidosaurus* and in particular also extends deeper downward, but does not extend up procimally to the articular surface and in this respect differs essentially from the Theropoda. In *Ammosaurus* the thin process probably extends much higher, as the fracture surface indicates, for a part of it is repaired with plaster there. But the ischium of *Ammosaurus* is not orthopod by a long way, but it stands even nearer the Theropoda but differs from this in an orthopod manner. We know nothing of the pubis of *Ammosaurus*, although parts of it are probably preserved in the bone jumble above the ischium. The distal ends of both pubes are certainly present in *Scelidosaurus*. They lie directly below the left femur and parallel to it. The two rod-like distal ends lie side by side for a length of 15-16 cm; their proximal part disappears into the stone. The visible part appears to be exactly like the ends of the ischia; thus *Scelidosaurus* has a completely true orthopod pelvis. It is unlikely that *Ammosaurus* was already developed so orthopod-like.

In *Ammosaurus* the highly placed greater trochanter on the femur also differs from the Triassic Theropoda; in the Jurassic *Megalosaurus* it also lies right at the proximal end, likewise in the ancient orthopod *Nanosaurus*. Its position in *Scelidosaurus* is not so high and is very like *Ammosaurus*.

As for the distal end of the tibia and the astragalus (see fig. 9), I have already commented above in the description on their similarity with Orthopoda such as *Camptosaurus*, *Claosaurus*, *Scelidosaurus* is also somewhat similar. The twisting of the tibia is found also in the Jurassic Theropoda such as *Megalosaurus*, *Streptospondylus*, etc. but then the astragalus always has a projecting process there. The pes of *Ammosaurus* differs in no way from that of a Triassic theropod. It must certainly be emphasized that *Scelidosaurus* also possessed a five-digit pes in which the first and fifth digits are likewise short, the fifth even rudimentary and the cuboid and cuneiform II have the same size as is the case in *Ammosaurus*. It may arise from this that the structure of the pes in those early forms is not decisive for systematic determination; the structure of the pelvis is more reliable.

As a result of the comparison of *Ammosaurus* with other Dinosauria, we come to the conclusion that *Ammosaurus* is entirely orthopod-like in the ilium, the distal end of the tibia, and the astragalus, and that the ischium stands between that of the Orthopoda and that of the Theropoda; other less important parts incline more toward the Theropoda. Thus *Ammosaurus* can be regarded as the most primitive representative of the Orthopoda. According to this, the Orthopoda were evolved directly from the Theropoda and indeed from the Thecodontosauridae, for *Ammosaurus* stands nearest to these (*Anchisaurus*). If this conclusion is proved correct, one would have to regard the Thecodontosauridae as not only the oldest but also the most primitive Dinosauria, from which all other groups have evolved; indeed when I described *Dystrophaeus* earlier *loc. cit.*, I suggested that the Sauropoda also had evolved from the Triassic Theropoda. I think I will deal with these interesting questions (also whether the oldest dinosaurs may be closely related to *Protorosaurus*) in more detail on a broader basis in the description of the Dinosauria of the European Triassic.

According to the above statements, the extra-European Dinosauria should be classified as follows:

	Plateosauridae	*Euskelosaurus*
		Massospondylus
Theropoda	Thecodontosauridae	*Thecodontosaurus*
		Anchisaurus
	Coeluridae	*Coelophysis*
Orthopoda	?Nanosauridae	*Ammosaurus*

LITERATURE ON THE EXTRA–EUROPEAN DINOSAURIA OF THE TRIASSIC

1820. SMITH, N., Fossil bones found in Red Sandstone. *Amer. Journ. of Science.* Vol. 2. p. 146-147.
(“Human bones” = ?*Anchisaurus*.)

1854. OWEN, R., *Descriptive Catalogue of the fossil organic remains of Reptilia and Pisces contained in the Museum of the Royal College of Surgeons*. London, pp. 97 ff.
(Short descriptions of *Massospondylus carinatus, Pachyspondylus orpenii, Leptospondylus capensis* without figures.)

1858. HITCHCOCK, E., *Ichnyology of New England. A report on the Sandstone of the Connecticut Valley, especially its fossil footmarks*. Boston.
(p. 187: Mention of *Megadactylus* without names and figure.)

1865. —, *Supplement to the Ichnyology of New England. A report to the Government of Massachusetts in 1863*. Boston. Edited by his son C. H. HITCHCOCK.
(Appendix A, p. 39/40: “Bones of *Megadactylus polyzelus*”.)

1866. HUXLEY, On some remains of large dinosaurian reptiles from the Stormberg Mountains. *Quart. Journ.* Vol. 23. p. 1-6. (7 Nov. 1866.)
(*Euskelosaurus browni and Orosaurus*.)

1869. COPE, E. D., Synposis of the extinct Batrachia, Reptilia and Aves of North America. *Transact. Amer. Philos. Soc.* Vol. 14.
(*Megadactylus polyzelus*, p. 122, pl. 13.)

1870. —, On the *Megadactylus polyzelus* of HITCHCOCK. *Amer. Journ. of Science.* (2) Vol. 49. p. 390-392. Extr. from “Extinct Batrachia, etc.” *Ann. and Mag. Nat. Hist.* (4) Vol. 5. p. 454-455.

1870. —, Reptilia of the Triassic formations of the United States. *Amer. Naturalist*. Vol. 4. p. 562-563.
(*Megadactylus.*)

1870. FISCHER, PAUL, Recherches sur les Reptiles fossiles de l’Afrique australe. *Nouv. Arch. du Muséum d’Hist. naturelle de Paris*. Vol. 6. p. 163-200. pl. 10 and 11.
(*Euskelosaurus* figured and described, but without names.)

1883. BAUR, G., Der Tarsus der Vögel und Dinosaurier. *Morphol. Jahrb.* Vol. 8, p. 417 ff.
(*Amphisaurus* named thus for the first time, p. 443, based on *Megadactylus polyzelus*. Figure.)

1884. —, Dinosaurier und Vögel. Erwiderung am Herrn. DAMES. *Morphol. Jahrb.* Vol. 10, p. 446 ff.
(p. 447: *Amphisaurus.*)

1885. MARSH, Names of extinct Reptilia. *Amer. Journ. of Science*. (3) Vol. 10. p. 169.
(*Amphisaurus* changed to *Anchisaurus* since preoccupied.)

1887. COPE, E. D., The Dinosaurian genus *Coelurus*. *Amer. Naturalist*. Vol. 21. p. 367-369.
(*Coelurus longicollis* and *bauri*. For the first time here as species.)

1887. —, A contribution to the History of the Vertebrata of the Trias of North America. *Proceed. Amer. Philos. Soc.* Vol. 24. No. 26. p. 209-229.
(*Tanystrophaeus longicollis*, *bauri*, and *willistoni*. Best description.)

1889. —, On a new Genus of Triassic Dinosauria. *Amer. Naturalist*. Vol. 23. p. 625-626.
(*Coelophysis*.)

1889. MARSH, Notice of new American Dinosaurs. *Amer. Journ. of Science*. Vol. 37. p. 331-332.
(*Anchisaurus major*.)

1889. LYDEKKER, *Orinosaurus capensis*. *Geol. Mag.* (3) Vol. 6. p. 353.
(*Orinosaurus* for *Orosaurus*. Specific name here for the first time.)

1890. —, *Catalogue of the fossil Reptilia and Amphibia in the British Museum. Pt. 4.* p. 246-251.
(*Massospondylus.*)

1891. SEELEY, On *Agrosaurus macgillivrayi*, a saurischian Reptile from the NE coast of Australia. *Quart. Journ.* Vol. 47. p. 164-165. (6 fig.)

1891. MARSH, Notice of new vertebrate fossils. *Amer. Journ. of Science*. Vol. 42. p. 265-269.
(Genus *Ammosaurus* and species *Anchisaurus colurus* here for the first time.)

1892. —, Notes on Triassic Dinosauria. *Amer. Journ. of Science*. Vol. 43. p. 543-546. (3 tab.)
(*Anchisaurus* and *Ammosaurus*. *Anchisaurus solus* for the first time.)

1893. —, Restoration of *Anchisaurus*. *Amer. Journ. of Science*. Vol. 45. p. 160-170. pl. 6.

1893. —, Restorations of *Anchisaurus, Ceratosaurus* and *Claosaurus*. *Geol. Mag*. (3) Vol. 10. p. 150-157, pl. 6 and 7.
1894. SEELEY, On *Euskelosaurus browni*. *Ann. and Mag. Nat. Hist.* (6) Vol. 14. p. 317-340. (7 fig.)
1894. —, On *Hortalotarsus*, a new saurischian fossil from Barkly East, Cape Colony. *Ann. and Mag. Nat. Hist.* (5) Vol. 14. p. 411-419. (1 fig.)
1895. MARSH, The Dinosaurs of North America. *Papers accomp. the Annual Report of the Director of the U.S. Geological Survey*.
(Very important! Many plates, *Anchisaurus colurus* and *solus*, *Ammosaurus major*, "*Anchisaurus*" *polyzelus*.)
1895. SEELEY, On the type of the Genus *Massospondylus* and on some vertebrae and limb-bones of *Mass*. (?) *browni*. *Ann. and Mag. Nat. Hist.* (6) Vol. 15. p. 102-132.
(*Mass. carinatus*, *Pachyspond. orpenii, Leptospond. capensis* combined as *Mass carinatus*. *Mass*. (?) *browni* placed in the region of Hortalot.)
1895. MARSH, On the affinities and classification of the dinosaurian reptiles. *Amer. Journ. of Science*. Vol. 50. p. 483-498. pl. 10.
(*Anch. colurus*, Anchosauridae.)
1895. —, On the affinities and classification of the dinosaurian reptiles. *Compt. rend. Congrès internat. de Zool. Leyden*. p. 196-211. (1 tab., 11 fig.)
(*Anch. colurus*, Anchosauridae.)
1902. HAY, O. P., Bibliography and Catalogue of the fossil Vertebrata of North America. *Bull. U.S. Geol. Survey*. No. 179. Washington.
(Complete literature list on America up to 1900.)
1905. WILLISTON, S. W., The *Hallopus*, *Baptanodon* and *Atlantosaurus* Beds of MARSH. *The Journ. of Geology*. Vol. 13. p. 338-350.
(p. 338-341: it is shown as likely that *Hallopus* and *Nanosaurus* belong in the Triassic. Purely stratigraphic study.)

LITERATURE[1] ON TEETH THAT ARE DESCRIBED AS DINOSAURIAN, BUT ONLY SOME OF WHICH ARE

1865. HUXLEY, On a collection of vertebrate fossils from the Panchet rocks, Ranigunj, Bengal. *Mem. Geol. Surv. India. Palaeontol. Indica. Ser. IV. Pretertiary Vertebrata*. Vol. 1. p. 3-24.
(*Ankistrodon indicus* described and figured for the first time [probably a *Thecodontosaurus*.].)
1871. COPE, E. D., Observations on the distribution of certain extinct Vertebrata in North Carolina. *Proceed. Amer. Philos. Soc.* Vol. 12. p. 210-216.
(*Zatomus sarcophagus* not figured, but probably in 1857 without name by EMMONS in: *American geology, etc*., pt. 6, p. 62, fig. 34.)
1877. —, Description of extinct Vertebrata from the Permian and Triassic formations of the United States. *Proceed. Amer. Philos. Soc.* Vol. 17. p. 182-193 (also in *Pal. Bull*. No. 26.)
(*Suchoprion* (*Palaeoctonus*) *cyphodon*, *Clepsysaurus veatleyanus* [species for the first time], *Palaeoctonus appalachianus* [genus for the first time].)
1878. —, On some Saurians found in the Triassic of Pennsylvania by C. M. WHEATLEY. *Proceed. Amer. Philos. Soc.* Vol. 17. p. 231-232 (also in *Pal. Bull*. No. 26.)
(*Suchoprion aulacodus, Thecodontosaurus fraserianus* and *gibbidens*. Species for the first time. Fig.)
1888. LYDEKKER, *Catalogue of the fossil Reptilia and Amphibia in the British Museum. Pt. 1.*
(p. 174: Genus *Epicampodon* for *Ankistrodon indicus* HUXLEY 1865 [see above].)
1890. — , *Catalogue, etc. Pt. 4.*
(*Massospondylus hislopi* from India and *Mass. rawesi* from India, figured here and in LYDEKKER, 1890, *Rec. Geol. Surv. India*. Vol. 23. Pt. 1. p. 22 and pl. 6.)
1893. COPE, E. D., A preliminary report on the Vertebrata of the Llano Estacado. *4th Ann. Rep. Geol. Surv. of Texas*. p. 1-136. 33 tab.
(*Palaeoctonus appalachianus, P. orthodon, P. dumblianus*. All figured.)

[1] This list is not complete but only the most important, particularly first, descriptions are mentioned. In HAY *loc. cit.* those missing appear.

FIGURE CAPTIONS

Fig. 1. Left lower jaw ramus of *Dryptosaurus incrassatus* COPE from the Canadian Cretaceous. Copy from L. M. LAMBE, *Ottawa Naturalist*, 17, pl. III. Ang. Angular, Art. articular, Cor. coronoid, D. dentary, psp. presplenial, Sp. splenial, Sur. surangular.

Fig. 2. New reconstruction of the skull of *Anchisaurus colurus* MARSH at nat. size. The dotted outlines cannot be exactly determined in their position or in part not obtained. The names are self-explanatory.

Fig. 3. Proximal end of the left scapula of *Anchisaurus colurus* MARSH in lateral view. The lower edge is partly covered by the humerus. On pl. II(IX), hardly visible; drawn from the cast in Tübingen, 1/2 nat. size.

Fig. 4. a, Right pubis of *Anchisaurus colurus* MARSH in ventral view. b, outline of distal end surface. On the photograph, pl. II(IX), it is hard to make out because of the color differences; drawn from the cast in Tübingen. 1/2 nat. size.

Fig. 5. Right femur with proximal end of tibia and fibula of *Anchisaurus colurus* MARSH with several overlying bones: 1, 1, the acetabular processes of the right ilium; 3, centrum; 2, sacral rib of the second sacral vertebra in outline; 5, centrum; 4, sacral rib of the first sacral vertebra; 6, 6, proximal end (subacetabular process and neck) of the right pubis. I and II, cross-sections of the femur in the places in question. Since the right hind limb is bent at the knee, upper and lower leg cannot be seen on pl. II(IX). Drawn from the cast in Tübingen. 1/2 nat. size.

Fig. 6. Tibia and fibula with femur end of *Anchisaurus colurus* MARSH in posterior view. Drawn from the cast in Tübingen. 1/2 nat. size.

Fig. 7. Combination of the visible and the probable outline of the proximal articular surface of the tibia of *Anchisaurus colurus* MARSH. From the cast in Tübingen. 1/2 nat. size.

Fig. 8. Sacrum and last dorsal vertebra of *Brontosaurus excelsus* MARSH. 1/20 nat. size. Copy from MARSH, "Dinosaurs of North America," pl. 33, fig. 1. Compare the forking of the last sacral vertebra with that of *Ammosaurus*.

Fig. 9. Distal ends of tibia and fibula with astragalus and calcaneum of the right pes of *Ammosaurus major* MARSH, in anterior view. Partial copy from MARSH "Dinosaurs of North America" *loc. cit*. pl. 3. fig. 6.

Fig. 10. *Thecodontosaurus polyzelus* HITCHCOCK sp. Copy from COPE pl. 13 in *Trans. Amer. Phil. Soc*. etc., 1870. 2/3 nat. size. 1, left femur in posterior view; b, proximal end in anterior view; c, distal end in anterior view; d, distal end in ventral view; 2, proximal end of a fibula; 3, proximal end of the right tibia, lateral view, a, articular surface in dorsal view; 4, distal end of a fibula, a, tarsal bone (calcaneum or cuboid), b, metatarsal IV; 5 posterior dorsal centrum; 6, a (?) sacral centrum from the side; 7, two proximal caudal vertebrae from the left with haemapophysis pieces; 8, distal (ca, 25th) caudal vertebra from right; 9, right manus; 10, ischium shaft in anterior view, a, lateral view, c, distal end surface; 11, rib (?).

Fig. 10a. Reconstruction of the femur of *Thecodontosaurus polyzelus* HITCHCOCK sp. (see fig. 9, 1) from the three preserved pieces at 2/3 nat. size.

Fig. 11. Cross-section through the dorsal vertebra of *Coelophysis longicollis* COPE at nat. size. (on pl. X(XVII), fig. 3).

Fig. 12. a Distal articular condyle in ventral view, b proximal fracture surface of metacarpal III, left, of *Coelophysis longicollis* COPE at nat. size (on pl. X(XVII), fig. 8).

Fig. 13. Reconstruction of the thumb ungual of *Coelophysis longicollis* COPE in 2/3 nat. size. Reconstructed essentially from the articular surface (on pl. X(XVII), fig. 6).

Fig. 14. Right ilium of *Coelophysis longicollis* COPE in ventral view at nat. size (on pl. X (XVII), fig. 10). On the left is seen the iliac postacetabular process, on the right the preacetabular process, in the middle above the partly damaged high supraacetabular ridge that curves above the acetabulum.

Fig. 15. Medial view of the posterior point of the left ilium of *Coelophysis longicollis* COPE at nat. size (on pl. X(XVII), fig. 9). The high interior crest is visible.

Fig. 16. Posterior view of the piece in fig. 15 (on the left of fig. 15) at nat. size.

Fig. 17. Reconstruction of the right ilium of *Coelophysis longicollis* COPE. 2/3 nat. size.

Fig. 18. Upper surface of the pubis head of *Coelophysis longicollis* COPE in dorsal view (on pl. XI(XVIII), fig. 2). On the figure above is medial, below is the lateral edge, on the left is the subacetabular edge, nat. size.

Fig. 19. Distal end surface of the left femur of *Coelophysis longicollis* COPE (on pl. XI(XVIII), fig. 1), nat. size.

Fig. 20. Probable outline of the proximal articular surface of the no longer present right tibia of *Coelophysis bauri* COPE, nat. size, after COPE's measurement.

Figs. 21-30. *Euskelosaurus browni* HUXLEY. Stormberg Beds of Aliwal North, Cape Colony, South Africa, 1/4 nat. size.

- Fig. 21. Middle cervical vertebra, damaged; a, lateral view; b, ventral view. In the British Museum, n. R.2802.
- Fig. 22. Spinal process of a dorsal vertebra, posterior half; a, posterior view; b, lateral view. In the British Museum.
- Fig. 23. Third sacral vertebra (right) and first caudal vertebra (left) in right lateral view. In Paris.
- Fig. 24. Cross-section through the middle of the first caudal vertebra (fig. 23).
- Fig. 25. Cross-section through the middle of the third sacral vertebra (fig. 23).
- Fig. 26. Second and third caudal vertebrae from the left side with haemapophyses. In Paris.
- Fig. 27. Second haemapophysis (fig. 26) in posterior view.
- Fig. 28. Proximal end of the left tibia and fibula in anterior view. In the British Museum, no. R.1625a.
- Fig. 29. The former, particularly fibula, in lateral view.
- Fig. 30. Right pubis. In Paris. a, medial view (the ventral side is on the right of the figure); b, dorsal view with cross-sections I-III, whose upper edge represents the dorsal surface; c, proximal end in ventral view; d, upper surface of the pubic head and subacetabular process, the lower edge on the figure is lateral; e, distal end surface, the lower edge on the figure is ventral.

Figs. 31-33. *Euskelosaurus browni* HUXLEY. Stormberg Beds of Aliwal North, Cape Colony, South Africa, 1/4 nat. size.

- Fig. 31. Distal end of a left pubis different from the foregoing. In Paris. a, ventral view; b, medial view; c, distal view.
- Fig. 32. Right femur; proximal and distal end and fourth trochanter are missing. In the British Museum, no. R.1625. a, posterior view; b, medial view.
- Fig. 33. Right femur; piece of the proximal half. In the British Museum, no. R.1625. a, anterior view (greater trochanter and nutrient foramen); b, lateral view (profile of the greater trochanter (left) and the fourth trochanter (right)).

Fig. 33c. *Euskelosaurus browni* HUXLEY. Stormberg Beds, Aliwal North, Cape Colony, South Africa, 1/4 nat. size. View of the right femur piece in proximal view with profile of the greater and fourth trochanters (Tr. m. and Tr. IV). In the British Museum, no. R.1625.

Fig. 34. *Euskelosaurus browni* HUXLEY. Stormberg Beds of Aliwal North, Cape Colony, South Africa, 1/4 nat. size. In the British Museum, no. R.1625b. Distal end of the right tibia with fibula and astragalus. a, somewhat obliquely in anteromedial view; b, lateral view.

Fig. 35. *Euskelosaurus browni* HUXLEY. Stormberg Beds of Aliwal North, Cape Colony, South Africa, 1/4 nat. size. In the British Museum, no. R.1625c. Distal end of the left tibia with astragalus. a, anterior view; b, posterior view; c, dorsal view.

Fig. 36. *Euskelosaurus capensis* LYDEKKER sp. Stormberg Beds of Aliwal North, Cape Colony, South Africa. Damaged proximal end of the left tibia at 1/4 nat. size; a, lateral view; b, dorsal view. In the British Museum, no. R.1626.

Fig. 37. *Euskelosaurus capensis* LYDEKKER sp. Stormberg Beds of Aliwal North, Cape Colony, South Africa. Damaged proximal end of a left femur; a, posterior view; b, distal fracture surface in outline; 1/4 nat. size. In the British Museum, no. R.1626a.

Fig. 38. *Euskelosaurus browni* HUXLEY. Stormberg Beds of Aliwal North, Cape Colony, South Africa. Tarsals of the second row of the right pes: left of figure, cuboid; in the middle, cuneiform III; on the right, cuneiform II (with which cuneiform I is fused). In b, below on the right, and c, from the right, the proximal end of metatarsal II is seen; a, dorsal view; b, anterior view; c, ventral view; 1/4 nat. size. In Paris.

Fig. 39. *Euskelosaurus browni* HUXLEY. Stormberg Beds of Aliwal North, Cape Colony, South Africa. Two phalanges, probably of the fourth digit of the right pes; a, anterior view; b, posterior view; 1/3 nat. size. In Paris.

Fig. 40. *Euskelosaurus browni* HUXLEY. Stormberg Beds of Aliwal North, Cape Colony, South Africa. Phalanges and ungual phalanges of the pes; 1/3 nat. size. Copy from SEELEY, *Ann. Mag. Nat. Hist.* 1894, 332.

Fig. 41. "*Euskelosaurus*" (?) sp. Stormberg Beds, South Africa (Coll. BROWN 1876). Proximal half of the left femur; a, medial view; b, anterior view; 1/4 nat. size. In the Vienna Hofmuseum.

Fig. 42. "*Euskelosaurus*" (?) sp. Stormberg Beds, South Africa (Coll. BROWN 1876). Distal end of the left femur; a, ventral view (drawn as a reflection by the mounting of the bone); b, medial view; 1/4 nat. size. In the Vienna Hofmuseum.

Figs. 43-54. *Massospondylus carinatus* R. OWEN. Stormberg Beds of the Drakenberg, South Africa. In the Royal College of Surgeons, London, 1/2 nat. size.

- Fig. 43. Cervical vertebra (pl. XIII(XX) fig. 6) in anterior view (No. 331).
- Fig. 44. Centrum of one of the last cervical vertebrae; a, right lateral view; b, cross-section (No. 335).
- Fig. 45. Centrum of the first dorsal vertebra; b, cross-section (No. 334).
- Fig. 46. Cross-section through the ca. fifth dorsal vertebra (No. 337).
- Fig. 47. Middle caudal vertebra; a, ventral view (left of figure is anterior); b, left lateral view; c, posterior view (no number).
- Fig. 48. Proximal end of the left scapula (pl. XIV(XXI) fig. 8) in dorsal view (No. 349).
- Fig. 49. Proximally a smaller left scapula (No. 359) obliquely in ventral view; the articular surface for the humerus (above) and the coracoidal contact surface (below) are visible.
- Fig. 50. Left ilium (pl. XV(XXII) fig. 1) in anterior view (No. 358). Note the curving of the bone. The preacetabular process is broken off.
- Fig. 51. Proximal end, neck, head, and subacetabular process of the right pubis (No. 351); a, posteroventral view; b, medial view; c, dorsal view (the lower edge on the figure is lateral, left is posterior).
- Fig. 52. Upper part of the left ischium (the uppermost piece is missing; No. 353); a, lateral view; b, anterior view; c, lower fracture surface (cf. 53b).
- Fig. 53. Part of both ischial shafts (No. 386); a, ventral view (anterior view); b, dorsal cross-section; c, ventral cross-section.
- Fig. 54. Proximal end of the right femur seen in dorsal view (pl. XVI(XXIII) fig. 1). Left on figure is medial side, below the posterior side (No. 360).

Figs. 55-68. *Massospondylus carinatus* R. OWEN. Stormberg Beds of the Drakenberg, South Africa. In the Royal College of Surgeons, London, 1/2 nat. size.

- Fig. 55. Distal end of the left tibia (pl. XV(XXII), fig. 4); a, lateral view; b, ventral view (left of figure is anterior view, above is the lateral side, No. 364).

Fig. 56. Outline of the proximal end surface of left metatarsal II (No. 370). The left lower angle of the figure is anterolateral.
Fig. 57. Lateral view of the proximal end of left metatarsal II (No. 367). Left of figure is anterior.
Fig. 58. Distal end of right metatarsal III, anterior view (No. 368).
Fig. 59. Distal end of right metatarsal IV, anterior view (No. 371).
Fig. 60. Distal end of right metatarsal II (small individual), anterior view (No. 373).
Fig. 61. Right metacarpal I (No. 374); a, outline of proximal articular surface; b, ventral view (distal) (pl. XVI(XXIII), fig. 3).
Fig. 62. Distal end of first phalanx of the right pollex (No. 381); a, anterior view; b, posterior view; c, medial view.
Fig. 63. Ungual phalanx of the right pollex (No. 383); a, lateral view; b, articular surface (asymmetrical build).
Fig. 64. Ungual phalanx of the third manual digit (No. 385).
Fig. 65. Anterior view of the first phalanx of the right second pedal digit (No. 375).
Fig. 66. Anterior view of the first phalanx of the right manual second digit. The point of the second phalanx is also visible (no number). (Very large individual!)
Fig. 67. Anterior view of the first phalanx of the right second manual digit (small individual, No. 379).
Fig. 68. a, medial view of the ungual phalanx of the right first pedal digit; b, cross-section in the anterior third (right of figure is the medial side, No. 382).

Fig. 69. The complete right pubis of *Massospondylus carinatus* R. OWEN, ventral view, copy from SEELEY, *Ann. Mag. Nat. Hist.* XV, 1895, 110. 1/6 nat. size. The proximal end is No. 351 (see fig. 51).

Fig. 70. Outline of the proximal articular surface of the right tibia of *Massospondylus carinatus* R. OWEN (No. 363), 1/2 natural size (on pl. XV(XXII), fig. 3).

Fig 71. Right tarsus of *Thecodontosaurus skirtopodus* SEELEY sp. on pl. XIII(XX), fig. 1. Fig 1a in ventral view. Astragalus and calcaneum are seen below; on the left edge (on the figure) the small intermedium sits above. The second row of the tarsus is turned over upward and forward with the metatarsus; the long cuboid and parts of the broken cuneiform II and III are seen, above the cuboid the upper articular surface of Mt. V rises between Cub. and Cun. III and the angle of Mt. IV.

Figs. 72-81. *Thecodontosaurus skirtopodus* SEELEY sp. Stormberg Beds, Cape Colony, South Africa; 1/2 nat. size.
Fig. 72. Axis and anterior half of the third cervical vertebra seen in dorsal view (on pl. XIII(XX), fig. 3). From the Telle River. Described by SEELEY as *Massospondylus browni*.
Fig. 73. ca. fifth cervical vertebra in anterior view (on pl. XIII(XX), fig. 2) in cross-section. From the Telle River. Described by SEELEY as *Massospondylus browni*.
Fig. 74. ca. sixth dorsal vertebra in posterior view (on pl. XIII(XX), fig. 4). From Capeland, found in Vienna Hofmuseum (Coll. ADLER, 1886), as the following up to fig. 83.
Fig. 75. Cross-section through the dorsal vertebra on pl. XIII(XX), fig. 5. In Vienna.
Fig. 76. Dorsal vertebra; a, left lateral view (spinal and transverse processes broken off); b, dorsal view (left on figure is front); c, cross-section of the shaft as in *Thecodontosaurus antiquus* in Bristol. In Vienna.
Fig. 77. Piece of the proximal half of the left humerus seen in anterior view. Lateral process clear. In Vienna.
Fig. 78. Right humerus, lateral view (on pl. XII(XIX), fig. 2). In Vienna.
Fig. 79. Distal end of an (?) ischial shaft in three views. In Vienna.
Fig. 80. Distal articular surface of the left femur in ventral view (on pl. XII(XIX), fig. 5). In Vienna.
Fig. 81. Proximal articular surface of the left tibia (on pl. XII(XIX), fig. 6). In Vienna.

Figs. 82-85. *Thecodontosaurus browni* SEELEY sp. Stormberg Beds, Capeland; 1/2 nat. size. Figs. 84 and 85 described by SEELEY as *Massospondylus browni*.
Fig. 82. Posterior dorsal vertebra from in left lateral view. In Vienna,
Fig. 83. Middle dorsal vertebra, a, right lateral view, b, ventral view.
Fig. 84. Proximal end surface of the right femur in anterior view, the medial side is on the left of the figure, the posterior side below (on pl. XII(XIX), fig. 8). From the Telle River.
Fig. 85. Distal articular surface of the left femur (on pl. XII(XIX), fig. 7. From the Telle River.

Figs. 86-90. *Thecodontosaurus macgillivrayi* SEELEY sp. From clearly Triassic beds (grey-yellow breccias like the Magnesian Conglomerates from Bristol) of the northeast coast of Australia (exact locality unknown). In British Museum No. 49984. Figs. 89 and 90 are visible on the posterior side of the piece of stone into which the radius sticks.

Fig. 86. Left tibia, nat. size; a, left lateral view; b, proximal articular surface; c, proximal end in anterior view; d, distal end in anterior view; e, distal articular surface in ventral view (below on the figure is front, left is lateral).

Fig. 87. Damaged proximal half of the right tibia, nat. size.

Fig. 88. Distal end of the right radius, nat. size; a, anterior view (e.g., back of manus, because the forearm bones cross—this is confirmed by the strong curvature of the radius, see fig. 88b); b, view from the ulnar side; c, distal articular surface (the point on the left of the figure is directly ulnar); d, upper fracture surface.

Fig. 89. Long, broken-through ungual phalanx, probably of the pollex.

Fig. 90. a, damaged tooth, 4:1 nat. size; b, enlargement of the edge notching, 16:1 nat. size.

Fig. 91. Left ilium (with upper end of pubis, ischium, and femur) of *Ornitholestes hermanni* OSBORN from the Como Beds of Bone Cabin Quarry, Wyoming, 10:1 nat. size. Enlarged copy from OSBORN, *Bull. Amer. Mus. Nat. Hist.*, 19, 1903, 641. To compare with *Coelophysis* fig. 17.

Figs. 92-100. Reduced left ilia of different dinosaurs for comparison with *Ammosaurus*. Figs. 91-98 and 100 after MARSH, fig. 99 original drawing.

Fig. 92. *Nanosaurus*, orthopod, from Jurassic or Triassic.

Fig. 93. *Laosaurus*, orthopod, Jurassic.

Fig. 94. *Camptosaurus*, orthopod, Jurassic.

Fig. 95. *Claosaurus*, orthopod, Cretaceous.

Fig. 96. *Stegosaurus*, orthopod, Jurassic.

Fig. 97. *Sterrholophus*, orthopod, Cretaceous.

Fig. 98. *Allosaurus*, theropod, Jurassic.

Fig. 99. *Thecodontosaurus*, theropod, Triassic.

Fig. 100. *Morosaurus*, sauropod, Jurassic.

Figs. 101 and 102. *Scelidosaurus harrisoni* R. OWEN. Lower Lias of Lyme Regis. Reduced. Original photograph, Dr. C. W. ANDREWS in the British Museum. The ischia to be compared with *Ammosaurus* pl. V(XI).

Fig. 101. Posterior half of the skeleton for orientation. Above is seen the left ilium and below the left femur and both ischia.

Fig. 102. The ischia in a larger photo. On the right, below the distal end of the left femur, the posterior ends of both pubes are seen also projecting at a steeper angle.

PLATE CAPTIONS

Plate I(VIII).

Fig. 1 and 2. *Anchisaurus colurus* MARSH. Skull. Fig. 1 in right lateral view and fig. 2 in left lateral view, at nat. size. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA.

A and Ang	=	angular	P orb	=	postorbital
Ap pt	=	pterygoid process of basisphenoid	Pr front	=	prefrontal
B sph	=	basisphenoid	Pr mx	=	premaxilla
Cond	=	occipital condyle	Qu	=	quadrate
D and Dent	=	dentary	Q Jug	=	quadratojugal
Ex occ	=	exoccipital	S Ang	=	surangular
Front	=	frontal	S Occ	=	supraoccipital
Jug	=	jugal	Squ	=	squamosal
L	=	lacrimal	S t	=	sella turcica and above it forward-open braincase
Mx	=	maxilla	Tr	=	transversum [=ectopterygoid]
N	=	nasal	Tub	=	basioccipital tubera
P	=	parietal	Z	=	teeth
P Fr	=	postfrontal			

Plate II(IX).

Plate III(X).

Fig. 1. *Anchisaurus colurus* MARSH. Right forelimb (distal end of humerus, forearm, and manus), nat. size. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA. MARSH's original, preserved in Yale Museum, New Haven, Conn.

Plate IV(XI).

Fig. 1. *Anchisaurus* (?) *solus* MARSH. Skeleton from ventral side at ca. 2/5 nat. size. Head end (lower jaw) at top of plate, pelvis and left pes at bottom of plate. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA. MARSH's original, preserved in Yale Museum, New Haven, Conn. Beside it a ruler of 11 cm.

Plate V(XII).

Fig. 1. *Ammosaurus major* MARSH at ca. 2/5 nat. size. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA. MARSH's original, preserved in Yale Museum, New Haven, Conn. In addition to these pieces, tibia and astragalus (cf. text-fig. 9) figured by MARSH. Beside them a ruler of 11 cm.

The block above in the middle, see pl. VI(XIII) and VII(XIV); above left, see pl. IX(XVI), fig. 1; lower right, see pl. VIII(XV),

Plate VI(XIII).

Fig. 1. *Ammosaurus major* MARSH. Sacrum of three vertebrae and last dorsal vertebra, as well as upper end of the anterior femur in ventral view, nat. size. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA. MARSH's original, preserved in Yale Museum, New Haven, Conn.

The last sacral vertebra with forked sacral rib is at the right of the plate; on the bottom is seen the posterior point of the ilium and its articular surfaces for the ischium and pubis, the proximal end of the pubis (?), and that of the femur.

Plate VII(XIV).

Fig. 1. *Ammosaurus major* MARSH. Right ilium and proximal end of the right femur in right lateral view at nat. size. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA. MARSH's original, preserved in Yale Museum, New Haven, Conn.

Plate VIII(XV).

Fig. 1. *Ammosaurus major* MARSH. Metatarsals and some phalanges and tarsals of the left pes at nat. size. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA. MARSH's original, preserved in Yale Museum, New Haven, Conn. Anterior view.

Plate IX(XVI).

Fig. 1. *Ammosaurus major* MARSH. Point of the right pes, in anterior view. Connecticut Red Sandstone (Upper Triassic). Manchester, Conn., USA. MARSH's original, preserved in Yale Museum, New Haven, Conn. Nat. size.

Fig. 2. "*Euskelosaurus*" sp. Distal end of left femur in posterior view. Original in Vienna Hofmuseum (Coll. BROWN 1876, No. VII B 124, Karroo, South Africa). 1/2 nat. size, from a cast in Tübingen.

Plate X(XVIII).

Fig. 1. "*Euskelosaurus*" sp. Proximal end of left femur in posterior view. Original in Vienna Hofmuseum (Coll. BROWN 1876). Karroo, South Africa. 1/4 nat. size, from a cast in Tübingen.

Fig. 2. *Coelophysis longicollis* COPE. Axis. Original of COPE's description. Triassic. New Mexico. Preserved in the American Museum of Natural History, New York. Nat. size, from a cast in Tübingen. a, anterior view; b, right lateral view; c, ventral view.

Fig. 3. Same. Ditto. Nat. size. Dorsal centrum in left lateral view.

Fig. 4. Same. Ditto. Nat. size. Middle caudal vertebra. a, right lateral view; b, from ventral view.

Fig. 5. Same. Ditto. Nat. size. Posterior caudal vertebra. a, left lateral view; b, ventral view.

Fig. 6. Same. Ditto. Nat. size. A part of the pollex ungual. a, lateral view; b, view of articular surface (cf. text-fig. 13).

Fig. 7. Same. Ditto. Nat. size. First phalanx of left (?) second manual digit. a, lateral view; b, anterior view; c, posterior view.

Fig. 8. Same. Ditto. Nat. size. Distal end of left (?) metacarpal III. a, lateral view; b, posterior view.

Fig. 9. Same. Ditto. Nat. size. Posterior point of left ilium, lateral view (cf. text-fig. 15 and 16).

Fig. 10. Same. Ditto. Nat. size. Lower half of right ilium in lateral view (cf. text-fig. 17). (No. 2 in COPE.).

Plate XI(XVIII).

Fig. 1. *Coelophysis longicollis* COPE. Right femur. COPE's original. Triassic, New Mexico. Preserved in American Museum of Natural History, New York. Nat. size, from a cast in Tübingen. a, medial view; b, posterior view.

Fig. 2. Same. Ditto. Right pubis. Nat. size. a, medial view; b, lateral view (proximal end turned over below).

Fig. 3. *Coelophysis bauri* COPE. Anterior dorsal vertebra in lateral view. Locality, etc. as in figs. 1 and 2. Nat. size, from a cast in Tübingen.

Fig. 4. Same. Ditto. Nat. size. Middle caudal vertebra, anterior region in left lateral view.

Plate XII(XIX).

Fig. 1. *Coelophysis bauri* COPE. Sacrum, consisting of three vertebrae and last dorsal vertebra. COPE's original. Triassic, New Mexico. Preserved in American Museum of Natural History, New York. Nat. size, from a cast in Tübingen. a, right lateral view; b, left lateral view; c, ventral view.

Fig. 2. *Thecodontosaurus skirtopodus* SEELEY sp. Right humerus. Original in Vienna Hofmuseum (Coll. ADLER 1886). Upper Karroo, Cape Colony, South Africa. 1/2 nat. size, from a cast in Tübingen.

Fig. 3. Same. Ditto. Proximal end of a right humerus in posterior view. 1/2 nat. size (the lateral part is missing).

Fig. 4. Same. Ditto. Distal end of a left humerus in anterior view. 1/2 nat. size.

Fig. 5. Same. Ditto. Distal end of a left femur in posterior view. 1/2 nat. size.

Fig. 6. Same. Ditto. Proximal end of a left tibia, lateral view. 1/2 nat. size.

Fig. 7. *Thecodontosaurus browni* SEELEY sp. Left femur in posterior view. SEELEY's original. From the Stormberg Beds of the Telle River near Aliwal North, Cape Colony, South Africa. (From casts in the British Museum and Tübingen.) 1/2 nat. size.

Fig. 8. Same. Ditto. Right femur, medial view.

Plate XIII(XX).

Fig. 1. *Thecodontosaurus skirtopodus* SEELEY sp. Right pes. Upper Karroo of the region of Barkly East, Cape Colony, South Africa. SEELEY's original, from casts in the British Museum and Tübingen. 1/2 nat. size. a, view of the tibia in anterior view; the pes is opened upward, thus to be seen posteriorly. Beside the astragalus is seen the calcaneum; the cuboid on Mt. IV and V sits, beside it on Mt. III is the cuneiform III; between these three bones the intermedium is seen. b, posterior view of tibia and fibula (cf. for this text-fig. 71).

Fig. 2. Same. Anterior dorsal vertebra. Described by SEELEY as "*Massospondylus*" *browni*. Stormberg Beds of the Telle River near Aliwal North, Cape Colony, South Africa. Original in British Museum. 1/2 nat. size. Left lateral view.

Fig. 3. Same. Ditto. 1/2 nat. size. Axis and third cervical vertebra. a, from right; b, from below.

Fig. 4. Same. Anterior dorsal vertebra in left lateral view (probably one place further caudally from fig. 2 of this plate). Upper Karroo, Cape Colony, South Africa. Original in Vienna Hofmuseum (Coll. ADLER 1886). 1/2 nat. size.

Fig. 5. Same. Ditto. 1/2 nat. size. Posterior dorsal vertebra, centrum, right lateral view.

Fig. 6. *Massospondylus carinatus* OWEN. Cervical vertebra (ca. eighth of probably thirteen). From Upper Karroo of the region of Harrismith in the Drakensberg, Cape Colony, South Africa. Original in Royal College of Surgeons, London, No. 331. 1/2 nat. size, from a cast in Tübingen. a, right lateral view; b, ventral view.

Fig. 7. Same. Ditto, No. 332. 1/2 nat. size. Neural arch of a ca. fourth through sixth cervical vertebra in dorsal view.

Fig. 8. Same. Ditto, No. 333. 1/2 nat. size. Posterior half of a ca. fourth-sixth cervical vertebra in left lateral view.

Fig. 9. Same. Ditto, No. 336. 1/2 nat. size. Centrum of a middle dorsal vertebra in left lateral view.

Plate XIV(XXI).

Fig. 1. *Massospondylus carinatus* OWEN. Second sacral vertebra. From the Upper Karroo of the region of Harrismith in the Drakensberg, Cape Colony, South Africa. Original in Royal College of Surgeons, London, No. 346. 1/2 nat. size, from a cast in Tübingen. a, ventral view (the caudal edge stands on the left of the plate); b, right lateral view (small individual).

Fig. 2. Same. Ditto, No. 338. 1/2 nat. size. Anterior caudal vertebra (not the first) in right lateral view. (Large individual!)

Fig. 3. Same. Ditto, No. 347. 1/2 nat. size. Anterior caudal vertebra (rather further back than the former) in right lateral view. (Large individual!)

Fig. 4. Same. Ditto, No. 345. 1/2 nat. size. Middle caudal vertebra in left lateral view. (Large individual!)

Fig. 5. Same. Ditto, No. 343. 1/2 nat. size. Posterior (i.e., ca. 25th of over 40) caudal vertebra in left lateral view. (Large individual!)

Fig. 6. Same. Ditto, No. 354. 1/2 nat. size. Proximal end of a right humerus. a, anterior view; b, posterior view. (Large individual!)

Fig. 7. Same. Ditto, No. 356. 1/2 nat. size. Distal end of a right humerus. a, anterior view; b, posterior view. (Large individual!)

Fig. 8. Same. Ditto, No. 349. 1/2 nat. size. Proximal end of a left scapula, lateral view. (Large individual!)

Fig. 9. Same. Ditto, No. 350. 1/2 nat. size. Distal end of a left scapula (perhaps belonging with the former), medial view. (Large individual!)

Plate XV(XXII).

Fig. 1. *Massospondylus carinatus* OWEN. Left ilium, lateral view; the missing parts are restored by dotted lines. From the Upper Karroo of the region of Harrismith in the Drakensberg, Cape Colony, South Africa. Original in Royal College of Surgeons, London, No. 358. 1/2 nat. size, from a cast in Tübingen.

Fig. 2. Same. Ditto, No. 362. 1/2 nat. size. Articular surface at the distal end of the right femur, cf. pl. XVI(XXIII), fig. 2.

Fig. 3. Same. Ditto, No. 363. 1/2 nat. size. Proximal end of the right tibia. a, lateral view; b, posterior view.

Fig. 4. Same. Ditto, No. 364. 1/2 nat. size. Distal end of the left tibia in anterior view.

Plate XVI(XXIII).

Fig. 1. *Massospondylus carinatus* OWEN. Proximal end of the right femur in anterior view with beginning of the greater trochanter. From the Upper Karroo of the region of Harrismith in the Drakensberg, Cape Colony, South Africa. Original in Royal College of Surgeons, London, No. 360. 1/2 nat. size, from a cast in Tübingen. a, anterior view; b, medial view.

Fig. 2. Same. Ditto, No. 362. 1/2 nat. size. Distal end of the right femur. a, posterior view; b, lateral view.
Fig. 3. Same. Ditto, No. 374. 1/2 nat. size. Right metacarpal I. a, anterior view; b, posterior view.
Fig. 4. Same. Ditto, No. 366. 1/2 nat. size. Right metacarpal V. a, lateral view; b, anterior view.