II.—*Baluchitherium osborni* (*? syn. Indricotherium turgaicum, Borrissyak*).

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Preliminary notices have already been published of two genera of aberrant Rhinoceroses, whose fragmentary remains were found in close proximity in the same fossiliferous deposit at Chur-lando, in Baluchistan. One of them, *Paraceratherium*,* of which form fairly complete skulls and lower jaws have been obtained, is of the size of a large Rhinoceros, with molar teeth, also large, of a simple *Aceratherine* pattern, but with very abnormal lower incisors. The other, *Baluchitherium*,† the subject of the present paper, of which only some neck vertebræ, foot and limb bones are known, represents an animal elephantine in size and probably in some respects the largest land mammal as yet known.

Further interest has been given to these remains from the later discovery by Borrissyak, at Turgai, a province of North Turkestan, of fragments of an animal very similar to *Baluchitherium*. Borrissyak‡ has published an account of his discovery, naming the form *Indricotherium*, and describing certain foot and limb bones and vertebræ very like those described in this paper. At the same time he mentions some very large simple Rhinocerotine teeth, found separate but in the same locality, which he attributes to *Indricotherium*.§ From their apparently close resemblance to the large molar teeth which occur *in situ* in the skulls of *Paraceratherium* it is almost certain that both genera are represented at Turgai. Seeing that *Baluchitherium* is represented only by limb bones and vertebræ, and *Paraceratherium* by skulls alone, it is difficult to establish the relationship of these two forms; and, while it is very curious that two such strange members of the Perissodactyla should occur together, the evidence, as far as it exists, points to their being entirely separate species, as appears later on in this paper.

Of this remarkable animal, *Baluchitherium osborni*, the Bugti beds have yielded

* 'Ann. Mag. Nat. Hist.,' Ser. 8, vol. 8, December, 1911, p. 711.

† 'Ann. Mag. Nat. Hist.,' Ser. 8, vol. 12, October, 1913. (*Thaumastotherium* changed to *Baluchitherium*, same Journal, November, 1913.)

‡ 'Geol. Vestnik' (1915 ?), I have not been able to see this paper; 'Bull. Acad. Imp. Sci.,' Petrograd (VI), vol. 11, p. 287, 1917.

§ Described and figured 'Proc. Imp. Acad. Sci.,' 1916, p. 34.

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the following fragments, which, taken together, are to be considered the type specimens of the genus and species.

Vertebræ.—Atlas, two cervicals, one anterior dorsal.

Limb bones.—Two Humeri, one damaged Ulna; Femur, Tibia, Patella; eight

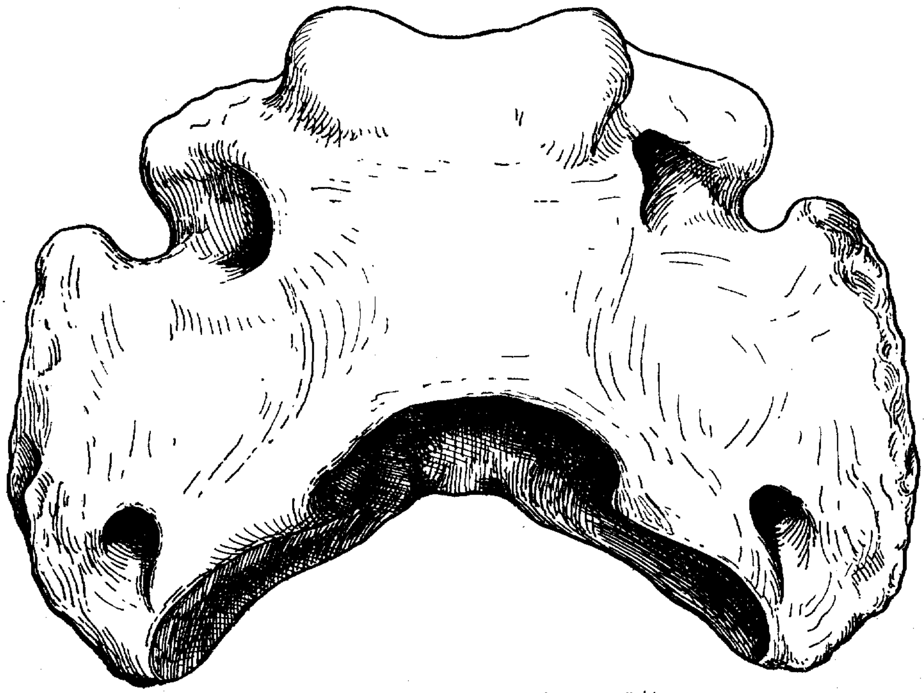

FIG. 1.—Atlas, upper surface, × 1/4.

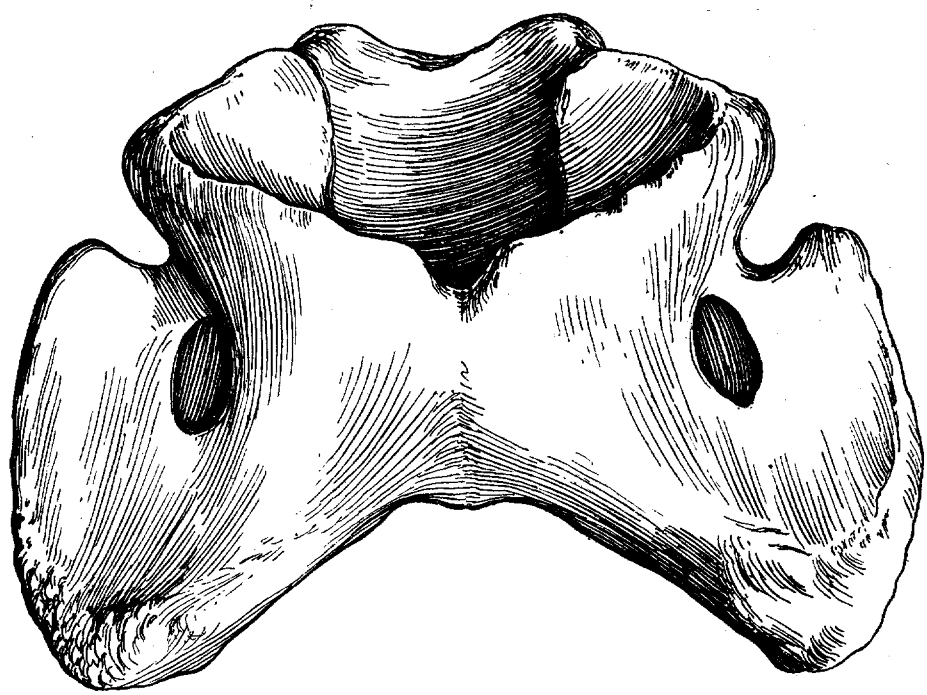

FIG. 2.—Atlas, lower surface, × 1/4.

Scaphoids, two Lunars, one Cuneiform, one Trapezoid, two Magnums, five Unciforms, three Astragali, two Naviculars, three Podials, and sundry Digits.

These bones show the occurrence of several animals of very different ages, as is witnessed by the scaphoids, for example, of which the largest measures 185 mm. in breadth, and the smallest 125 mm.

Of these remains the astragalus and the atlas are the most useful, the former because it shows the animal to have been without doubt a Perissodactyle, and the latter because it gives a measurement of the width of the condyles of the skull, and so

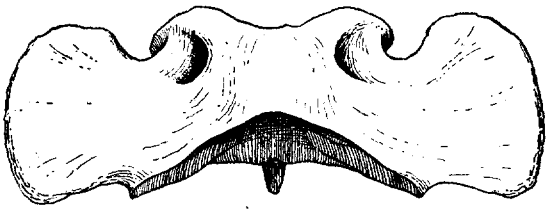

FIG. 3.—Atlas, *Rhinoceros unicornis*, × 1/4.

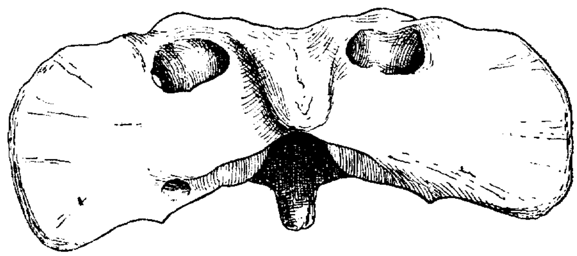

FIG. 4.—Atlas, *Rhinoceros simus*, with asymmetrical foramen on the posterior border, × 1/4.

yields evidence that the skulls of *Paraceratherium*, whose known condyles are by far too small (and possibly by implication the *Paraceratherium*-like teeth described by BORRISSYAK), do not belong to this species.

All the known skeletal fragments point to an extremely aberrant animal, and one which is not easily compared with other Perissodactyles. On the whole, the balance of evidence points to Rhinocerotine affinities, but comparisons are here instituted between this form, a *Titanotherium*, and a horse, as well as with the Rhinoceroses.

In general shape, *Baluchitherium* appears to have had a heavy body supported by pillar-like limbs, resting in turn on three very elongated toes, of which the middle one was enlarged. At the same time, the neck was very long—quite as much extended as that of the horse. The atlas shows that the back of the skull must have been

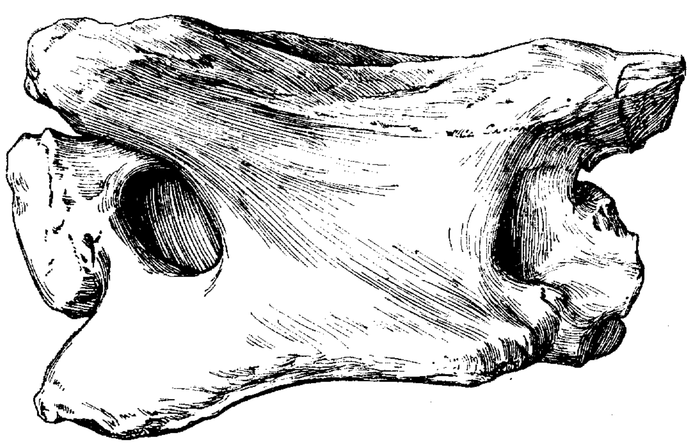

FIG. 5.—Third or fourth cervical vertebra, lateral view, × 1/4.

very broad, the condylar width being at least twice that of the largest known Rhinoceros. As will be seen in the following description of the various bones, there is in *Baluchitherium*, as might be suspected, a considerable amount of adaptation from the normal, in accordance with what must have been an abnormal type of existence.

VERTEBRÆ.

Judging from the three known cervical vertebræ, the length of the neck of *Baluchitherium* was of much the same proportion as that of the horse. The vertebræ are totally unlike those of the Rhinoceros, but show some approximation in general shape and proportions to those of the horse, the only Perissodactyle to which any likeness can be found. There are, however, notable differences, which may perhaps be explained as adaptations consequent upon the great weight of the skull.

FIG. 6.—Sixth cervical vertebra, anterior view, × 1/4.

The points of resemblance are, however, of great interest as examples of convergence in the shape of bones as the result of (presumably) similar stresses and strains in necks of equal proportional lengths.

The atlas (fig. 1) is flat on the dorsal surface, and lacks the median process (neural spine) on the dorsal arch, which is strongly marked in a specimen of *Rhinoceros simus* (Zool. Mus. Cant. H 6441), and which is present, though to a lesser extent, in *R. bicornis*, in the horse, and the tapir. Instead of this spine, the anterior border has raised on it a bifid prominence for the attachment of the ligamentum nuchæ. The vertebra also lacks, so far as can be seen, the posterior ventral tubercle, which is a feature of the atlas of rhinoceroses (figs. 3 and 4). The wings have each a pronounced notch on the anterior border, forming a groove to the intervertebral foramen. In *R. simus*, the horse, and the tapir this notch is covered by a bridge of bone, and so is transformed into a foramen. In a specimen of *R. unicornis* (Zool. Mus. Cant., H 6301, fig. 3) the atlas is in this respect more like that of *Baluchitherium.*

The notch rather than the foramen seems to be the commoner form in Rhinoceroses though a variable feature, and in a specimen of *R. sumatrensis* (Zool. Mus. Cant., H 6388) it is present on one side, while there is a complete foramen on the other.

Towards the posterior border of each wing on the dorsal surface is a foramen which leads into a canal running to the anterior alar foramen, having on its inner side a lateral pocket, a feature which is shown to a greater degree in the later cervical vertebræ. This canal presumably transmitted the vertebral artery (cerebro-spinal branch), which thus ran through the wing out at the lower front foramen (fig. 2) and then turned up *viâ* the anterior notch already described through the anterior foramen on its way to the head (fig. 1).

So, at all events, I interpret these foramina. OWEN* states that in the atlas of the Rhinoceros "the neural arch is perforated transversely by the vertebral artery." He

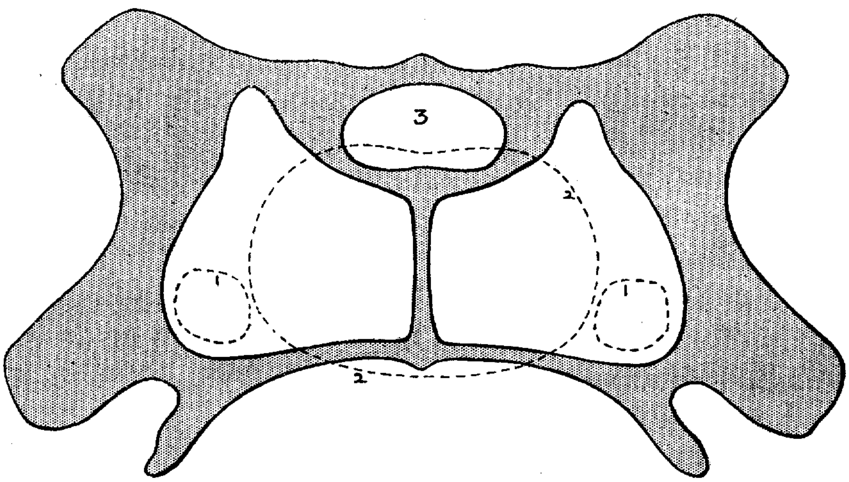

FIG. 7.—Diagram of a section of the sixth cervical vertebra, × 1/4; 1, position of vertebrarterial canal; 2, position of articular surface; 3, spinal canal.

does not state the species, and in five specimens of Rhinoceros in the Museum of Zoology at Cambridge I find four widely differing types of atlas, and none of them is quite comparable to *Baluchitherium*. In all of them the vertebral artery pierces the underside of the alar wing near its front border at right angles to the plane of the wing, which must be the sense in which OWEN used the term "transversely," but there is wide variation in the way it does this. There is always a foramen for the entrance of the cerebro-spinal branch of the vertebral artery into the neural canal after it has come through the notch or foramen, as the case may be, as is mentioned above. The presence or absence of a bony bar conditioning a foramen, or alternatively a notch, is probably not a very important feature, but it gives an extraordinarily different appearance to the atlas, as the figures show. The specimens examined were as follows:—

* 'Comparative Anatomy,' vol. 3, p. 445.

R. simus, two specimens (fig. 4), complete foramina.
R. unicornis (fig. 3), notches.
R. bicornis . notches.
R. sumatrensis (young female), notches.
R. sumatrensis, foramen on right, deep notch on left.

In all these vertebræ there is a considerable amount of variation in shape and in certain of the foramina, of which the most noticeable is in a specimen of *R. simus*, where a well-marked canal of short length pierces the posterior part of the neural arch on each side, just above the facets for the axis articulations. This is for a spinal nerve and is represented in the other specimens by a barely discernible groove. In the figured specimen of *R. simus* (fig. 4) it will be noticed that there is an unpaired foramen on the posterior left side. This foramen runs into a canal to join the alar foramen, and is more like the condition (for this one side) found in *Baluchitherium.*

These points are of interest as showing the range of variation and as a warning that too much stress must not be placed on these features in a single specimen, whether recent or fossil.

On the under surface (fig. 2), the only noticeable feature is the large foramen which is the anterior opening of the vertebrarterial canal, whose entrance is the posterior dorsal foramen mentioned above. From this opening the artery passes *viâ* the deep notch and into the neural canal through the anterior dorsal foramen seen in fig. 1.

It is evident that the atlas of *Baluchitherium* is not much like that of the modern Rhinoceroses. In the foramina and course of the blood vessels it differs somewhat, even after making due allowance for variation in these features, while in general shape it differs considerably. Actually in the shape and position of the foramina it is rather more like that of the horse, having a similar square outline, stout wings which are expanded in a fore and aft direction rather than transversely, and marked roughening of the edges for the insertion of muscles. The main difference between the two is that the vertebral artery in the horse, after entering the posterior dorsal foramen, does not run in a canal through the substance of the wing but along its lower surface, which is concave instead of flat, and that there is in front a complete foramen instead of a notch. Compared with the Rhinoceros the horse has a long neck, and *Baluchitherium*, judging from the form of its other known cervical vertebræ, had a neck as long as the horse. The similarity in general configuration, such as it is, may be due to a similarity in function.

The measurements of the atlas are :—

Extreme length of wings	475 mm.
Antero-posterior length of wings	240 ,,
Width of anterior condylar surfaces	280 ,,
Width of posterior articulating surfaces	320 ,,

The next vertebra in the collection (fig. 5) is either the third or fourth cervical. It is not quite wide enough in the articular surfaces to fit the undoubted sixth cervical next to be described.

This third, or fourth, cervical is in its proportions the most horse-like of all, as the following measurements show :—

Extreme length (making allowance for damaged ends) . . .	420 mm.
Extreme width (approximately)	400 ,,

The corresponding measurements in the fourth cervical of a horse are 138 mm. and 110 mm. respectively, so that the general proportions are not much out.

There is, however, a discrepancy in the shape of the articular surfaces of the centrum. In *Baluchitherium* it is transversely expanded and narrow from above downwards, the measurements being 190 mm. in width and 100 mm. in depth, the width thus making an index of nearly 2. In the vertebra of the horse the corresponding index is more nearly 1, and its articular surface is broad above, narrowing to more or less of a point below, a condition which does not occur in *Baluchitherium.* Nor are the ball-and-socket articulations so deep as in the horse.

The canal for the vertebral artery is also like that of the horse, except for the presence of the big excavation in the centrum, which is described in more detail in the next vertebra, the sixth cervical. This bone (fig. 6) is much narrower in the antero-posterior direction than the last, and being perforated by the vertebral artery cannot be the seventh. Its measurements are approximately 460 mm. in extreme width and 300 mm. in length. Except in the same particulars as described for the last vertebra this bone also is horse-like. There is, however, on the ventral surface, an additional flange on the median side of the transverse process forming, with the rest of the process, a deep fossa represented to a slight degree only in the horse. This pit, whose position can best be seen in the section (fig. 7), was probably for intervertebral ligaments. Being broken on one side it has been possible to make a closer investigation of the peculiarities of the vertebral canal by making a cast of the whole vertebra, and by then cutting a transverse section of the cast.* The resulting section shows some small points of difference from the diagram already published,† which was made by estimation of the capacity of the excavation. As can be seen in the present diagram (fig. 7), the vertebrarterial canal is enormously excavated, so much so as to reduce the centrum to a thin vertical plate of bone which with the dorsal and ventral surfaces of the vertebra form an I, a pattern well known to engineers, combining the maxima of strength and lightness. The vertebral canal is not round as in the original diagram, but is produced into a bay running a short distance under the posterior zygapophyses.

* This was done for me with great skill and accuracy by Mr. F. O. BARLOW of the British Museum.

† 'Ann. Mag. Nat. Hist.,' Ser. 8, vol. 11, 1913, p. 379, fig. 6.

The remaining vertebra (fig. 8) is an anterior dorsal, probably the first, and is in some respects the most remarkable of all. One feature, unique in the mammalia, as far as I am aware,* is the peculiar formation of the neural spine. In the horse, as in other mammals, the spines of the dorsal vertebræ are high, laterally flattened and moderately thick in the antero-posterior direction. In *Baluchitherium* the spine is not very high,† is extremely thin in the antero-posterior direction, and to an

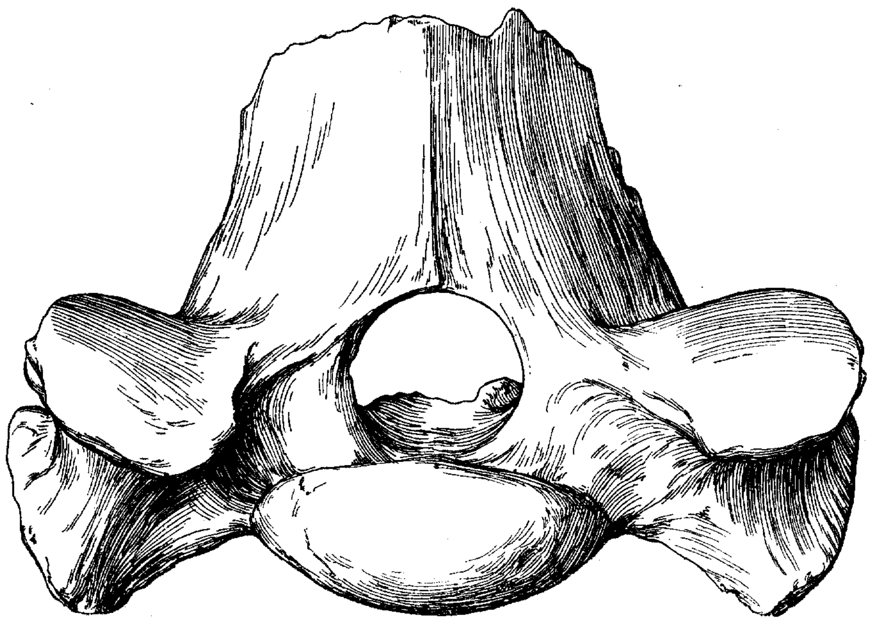

FIG. 8.—First thoracic vertebra, anterior view, × 1/4.

exaggerated degree is expanded from side to side, so that at its base where the posterior zygapophyses are placed it is considerably wider than the centrum and rib facets together. Between these zygapophyses, and just above the neural canal, the posterior surface of the spine is excavated into a large pit for large inter-spinal ligaments. At the base of the same zygapophyses, and just above the rib facets, is a deep circular pit, at first sight looking like a vertebrarterial foramen. It is, however, blind, and possibly served to lodge some ligament which must have run out sideways, as the pit is directly on the course of the spinal nerve. The rib facets for head and tubercle are fused, a peculiar feature.‡

LIMB BONES.

The humerus (fig. 9A, B, C, D) is an extraordinarily massive bone, and is in some respects *sui generis*. The most noticeable feature being the size of the internal

* *Diprotodon* shows a peculiar broadening, and partial doubling, of the neural spines. The arrangement however is not at all comparable with *Baluchitherium*.

† The top edge of the spine is broken away but the existing part is so thin, less than half a centimetre in parts, that it cannot have been much prolonged.

‡ BORRISSYAK found that the first rib had the head and tubercle united into one facet.

tuberosity which was apparently larger than the external, a reversal of the usual order. Both these processes, while very massive and of large area, are less expanded comparatively than are the corresponding parts of the Rhinoceros.

The deltoid ridge is hardly developed at all; the supinator, on the other hand, is

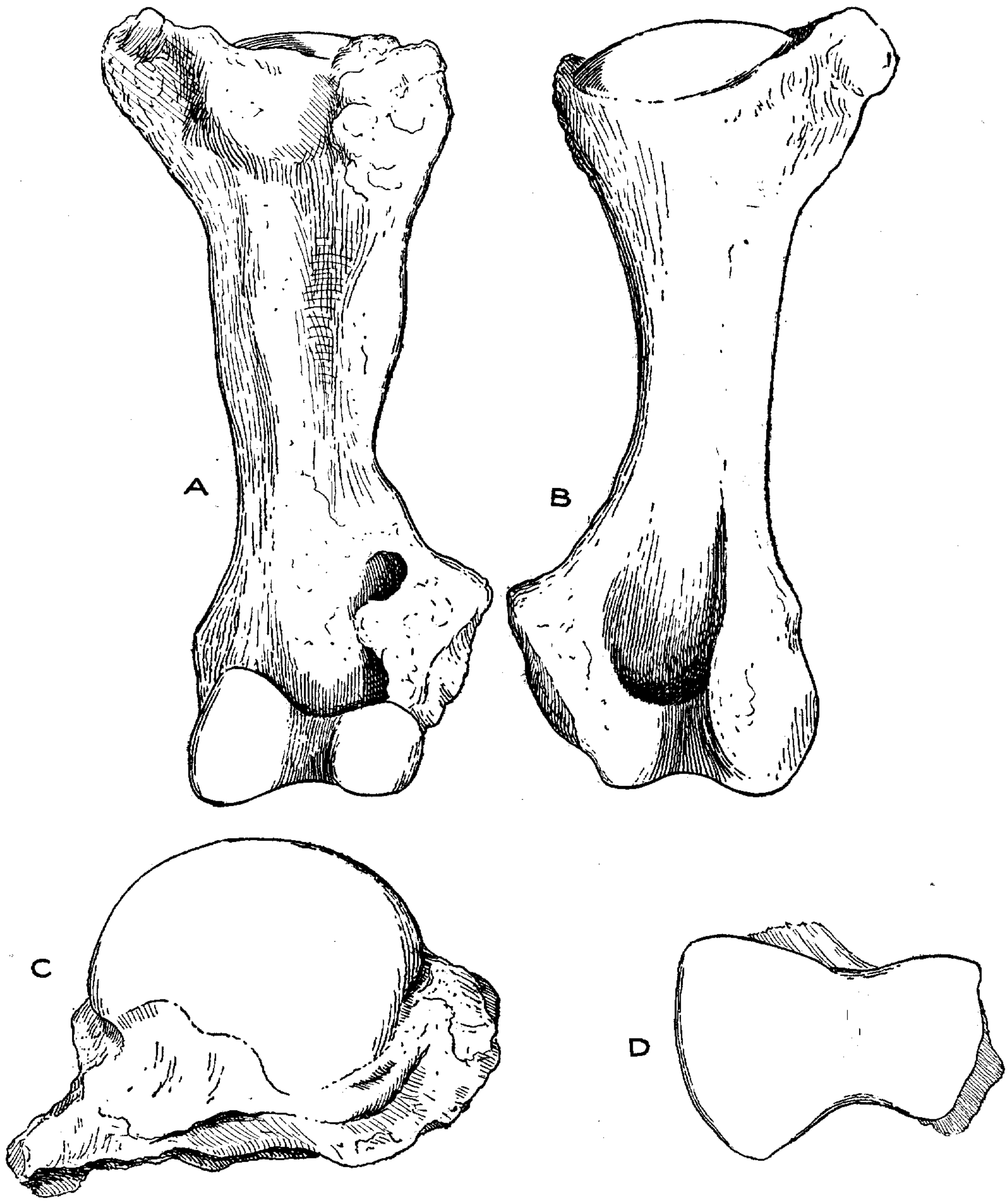

FIG. 9.—Humerus, A, anterior surface, B, posterior surface, × 1/8; C, head, superior surface, × 1/6; D, distal articular surface, × 1/6.

well developed; the teres tuberosity is barely developed at all. The anconeal fossa is very shallow.

Of the articular surfaces the proximal is flatter than that of the Rhinoceros and, when examined from above, the outline of the back part is rounded and the surface of the head in this region does not turn downwards, the whole surface being much more flat. No distinct bicipital groove can be made out. The distal articulation is hour-glass shaped as in the Rhinoceros, but with the intercondylar groove rather more flat. The epicondylar prominences are in comparison with the Rhinoceros less marked, and the external does not extend down so as to form a projection at the side of the condyle, but slopes away from the supinator ridge to vanish just above the condyle, thus giving the supinator the appearance of a sharp point. The coronoid fossa is comparatively shallow, and the area for the attachment of the extensors of the carpus and digits is not well developed. These characters all point to the conclusion that the fore limb was little angulated and was pillar-like in action. On the whole, in its general features, the characters of the bone are Rhinoceros-like, but overlaid with adaptations to weight-bearing. It lacks all the distinctive characters of the horse.

The radius is not represented in the collection, BORRISSYAK states that it is very long and that its distal end shows a remarkable differentiation of its articular surfaces, the relationship of the bones of the forearm being so arranged that, in distinction from the Rhinoceros, the radius occupies a cuneiform space so that there is only an external space left for the ulna.*

Of the ulna (fig. 10) there is a specimen lacking the distal end. It shows well marked differences from that of other Perissodactyles. The olecranon is stout, blunt, but little turned upward, and, comparatively speaking, is small in extent (rather less than that of a specimen of an African elephant), implying but small power of the extensors. The anconeal process is small and the semilunar notch very shallow. The ridge of the inner side of the inter-osseous border is well marked, and runs from the articular surface to about one-third of the way down the shaft. The shaft is long, thin, and there is no sign of any fusion with the radius.

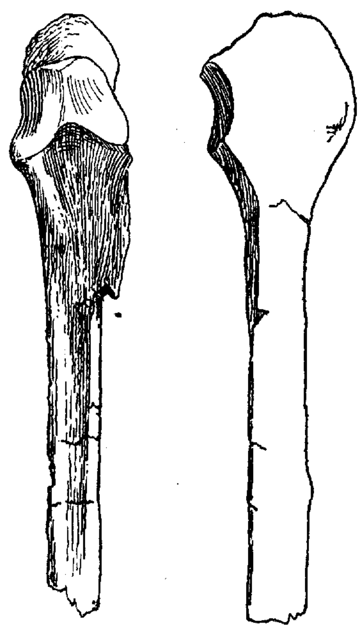

FIG. 10.—Ulna, anterior and lateral views, × 1/8.

BORRISSYAK describes a more complete bone, 1,200 mm. in length, which agrees very well with this one. In addition, he states that the distal end is "cylindrical"† and not saddle-shaped as in the Rhinoceros.

The femur (fig. 11A, B, C) in its general appearance is very proboscidian, a long straight bone, broad from side to side, and thin from front to back. The head is hemispherical, and

* This is borne out by the facets of the cuneiform, see below.

† This word may not be correctly translated. The facet for the cuneiform must have been elongated and slightly heterocœlous. See under description of cuneiform.

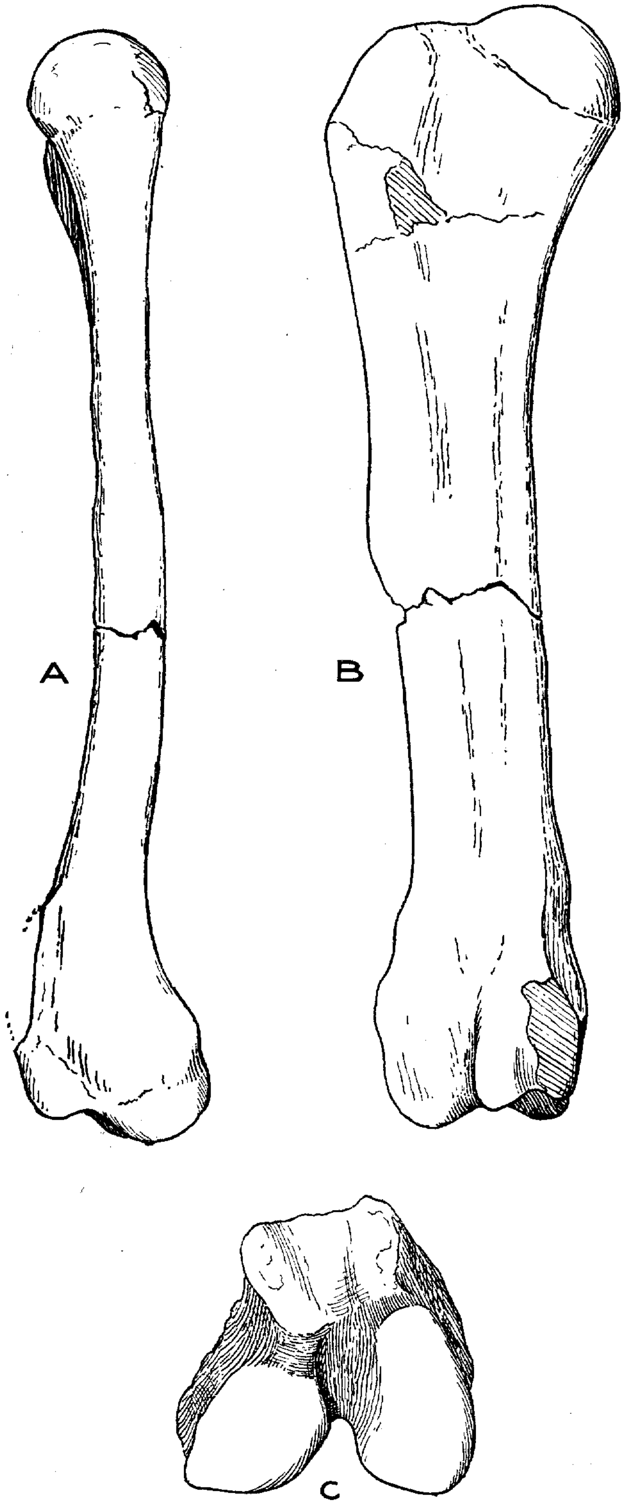

FIG. 11.—Femur, A, internal lateral surface, × 1/8 ; B, anterior surface, × 1/8 ; C, distal articular surface, × 1/6.

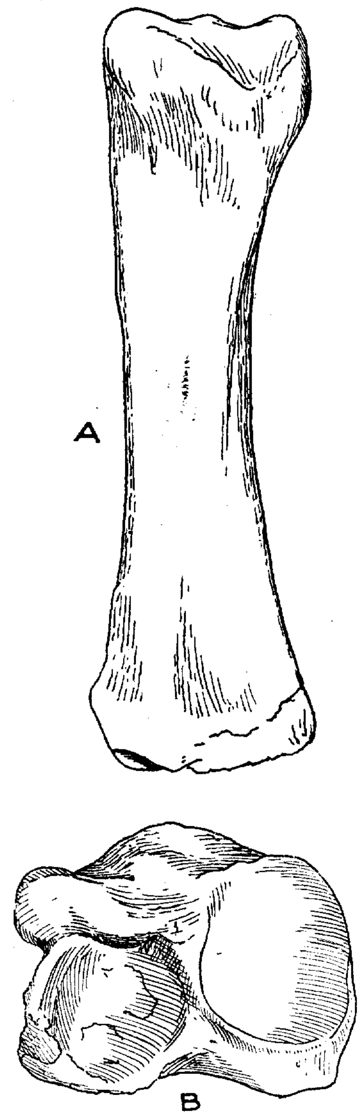

FIG. 12.—Tibia, A, Anterior view, × 1/8 ; B, Distal articulation, × 1/6.

is placed on the shaft in such a manner that there is hardly any neck, less even than in the elephant. Of the trochanters, the major is a large bulging area as in the elephant, and is without crest or trochanteric ridge; the minor is not visible, and the third placed about half-way down the shaft is barely so.*

The Patella.

One specimen of this bone occurs in this collection; the ental (larger) surface in contact with the femur lies at the same angle with the ectal (smaller) as in the patella of the Rhinoceros, the dividing ridge being equally sharp in both forms as opposed to the rounder and shallower division in the horse. The ental surface however differs in shape from both horse and rhinoceros, in which animals it is an irregular trapezoid; here it is triangular, the apex pointing upwards. The bone, though of course massive, is in proportion rather flattened out on the upper surface.†

The Tibia.

This is a straight bone (fig. 12A and B) with the cnemial crest only moderately well marked and keeping rather to the outer side; the extremities are not very strongly expanded. There is a general resemblance to the elephant.‡

The Feet.

As might be expected of so bulky an animal as *Baluchitherium* the feet show adaptations corresponding to the load carried.

The appearance of the reconstructed manus is one of extraordinary height. This is due to the great length of the metapodials, the digits being much compressed and the carpals somewhat so though not to so great a degree as in *Titanotherium*. Actually the proportions do not seem to be much different from those of *Triplopus*,§ a much earlier animal with which *Baluchitherium* may yet be found to have something in common, though vastly different in size and separated by a great interval in time.

The carpal and tarsal bones at first sight show little resemblance to any one type of Perissodactyle. Some characters appear horse-like, others, perhaps the majority, are of a generalised Rhinocerotine pattern. Others, again, are peculiar.

As all these points require a rather close examination to render them clear,

* It is however present. In my preliminary notice (*loc. cit.*) I stated that it was absent. This was an error.

† BORRISSYAK describes his specimen as "more elegant and its articular surfaces more highly developed than in the Rhinoceros."

‡ BORRISSYAK describes this bone as "three faced and broadening out slightly at the ends." Also the fibula, which is not represented in this collection, as being very thin. Both bones he finds as relatively short, but here the proportions of tibia to femur which probably belong to one individual are roughly as in the elephant and the tibia is not noticeably short.

§ OSBORN, H. F., in SCOTT and OSBORN, "Uinta Mammalia," 'Trans. Amer. Philos. Soc.,' N.S., vol. 16, Part III, 1889.

Scaphoid.

	Baluchitherium (figs. 13, 18).	*Equus* (figs. 16, 20).	*Rhinoceros* (figs. 15, 22).	*Titanotherium* (figs. 14, 24).
Relation of anteroposterior (depth) to transverse (width) measurements of radial articular surface	Depth greater than width.	Approximately equal.	Depth a little greater than width.	Approximately equal.
Shape of the radial articular surface.	Rises to a point on the lunar side towards the front border, from this point it slopes away under the lunar. The posterior surface is hollowed into a well-marked basin.	The point is less marked, and is situated more towards the lunar. Hardly runs under the lunar at all. Basin well marked.	More like *Baluchitherium*, but the point is more centrally placed on the front edge. There is a similar slope towards the lunar, but the latter bone overhangs to a less degree. The basin is well marked.	The whole surface is flatter. There is no slope towards the lunar, and the latter bone does not overhang at all. Basin shallow.
Scapho-lunar articulation.	Diagonal. In close contact only in the middle region. The extent to which the lunar overhangs the scaphoid is, in each case, mentioned in the section above.	Fairly straight across the wrist. A large surface of contact except for a notch at the posterior end.	Diagonal. Large surface of contact.	Straight across from front to back. A large surface of contact.
Distal articular surface.	Trapezoid facet concave, magnum facet flat in front, hollow behind, no ridge between them. No trapezium facet.	Somewhat similar to *Baluchitherium* in the hollow trapezoid and flat magnum facets, and in the absence of ridge and trapezium facet.	Trapezoid and magnum facets heterocœlous, convex in the anteroposterior direction; the two facets being divided by a sharp ridge. A small triangular facet is present for the trapezium.	The whole surface is flat.

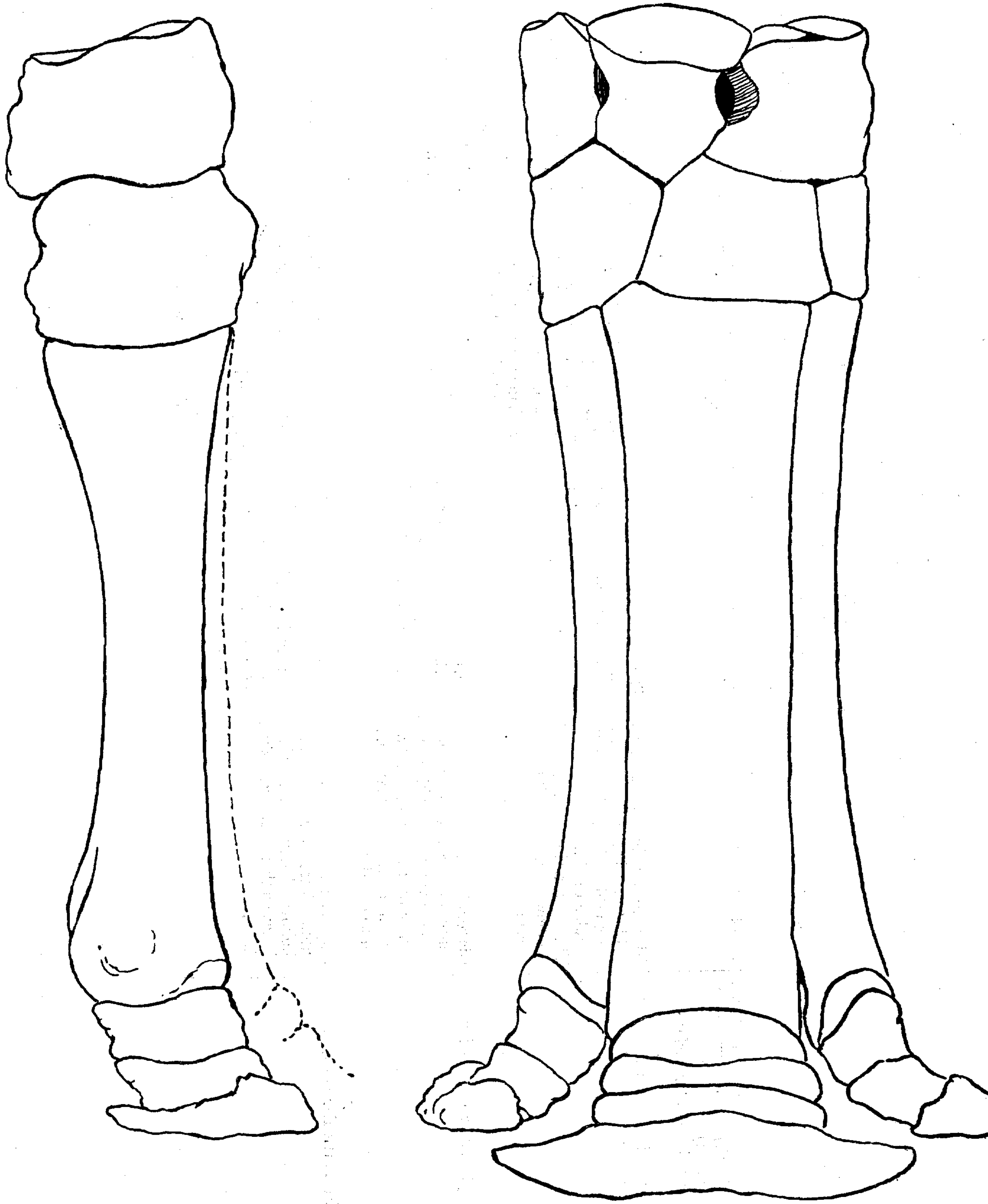

FIG. 13.—Reconstruction of the fore foot, front and lateral views, × 1/4. It is possible that the metapodials are a little too long.

comparisons are here drawn up, partly in tabular form, between *Baluchitherium*, a horse, a rhinoceros and *Titanotherium*.*

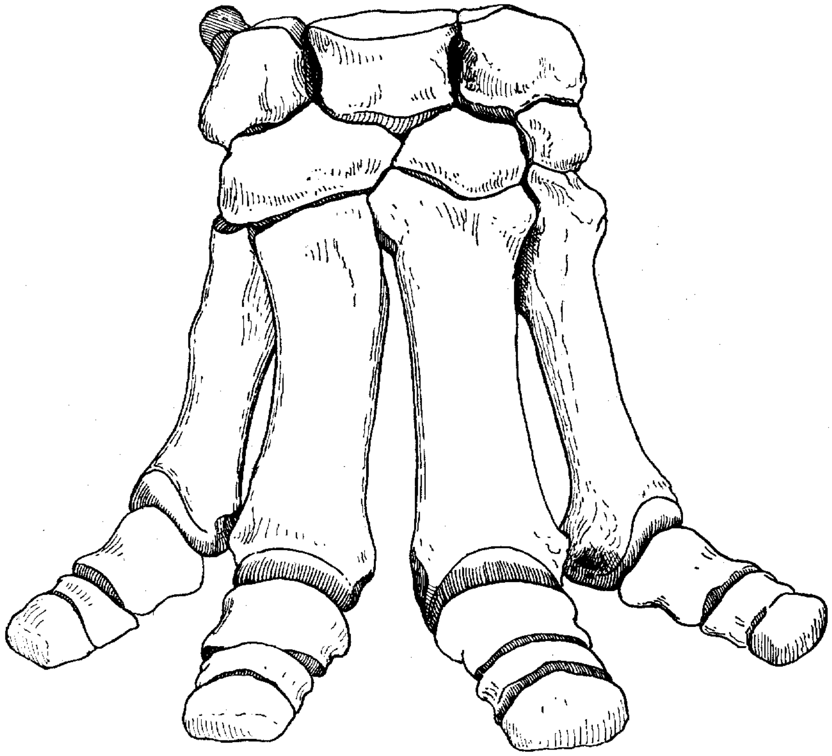

FIG. 14.—Fore foot of *Brontotherium gigas*, drawn from a cast by the American Museum of Natural History, × 1/4.

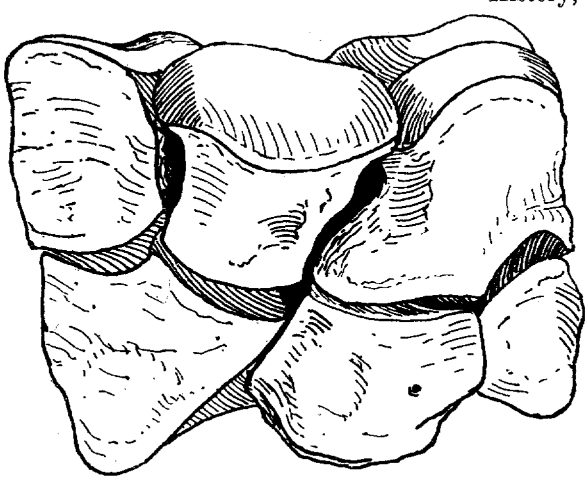

FIG. 15.—Carpus of *Rhinoceros unicornis*, anterior surface, × 1/2.

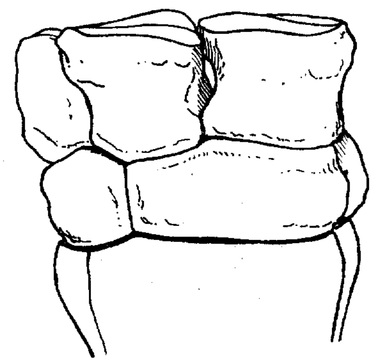

FIG. 16.—Carpus of Horse, × 1/2.

It will be noted that fig. 13 (which seems at first sight to be on an unduly large scale) and fig. 14, both representing complete feet, are drawn to a scale of one-half only of the carpal bones. It is desirable for comparison that the scale should be uniform throughout, but owing to the enormous size of *Baluchitherium* this is not possible. A greater reduction on a uniform scale would have made the figures of the horse too small to be of use, and to have reduced the larger animal still more out of proportion to the others, if not actually misleading, would have missed one of its outstanding characters.

* Comparisons with the feet of the aberrant Chalicotheres were found to yield little information and with those of the Tapirs surprisingly little except in a few points.

LUNAR.

	Baluchitherium (figs. 13, 18).	*Equus* (figs. 16, 20).	*Rhinoceros* (figs. 15, 22).	*Titanotherium* (figs. 14, 24).
Radial articulation	There is a flat shelf-like area in front which runs diagonally round on the cuneiform side and rises to a convex surface. This surface runs diagonally across the bone from the scaphoid side in front where it overhangs that bone, back towards the posterior border of the cuneiform. At the back of the scaphoid side there is an irregular surface sloping downwards, which seems to represent the flat area noted in *Titanotherium*, but the pit found in the latter animal is not represented.	A flat shelf in front, but on the scaphoid side.	Practically no shelf in front. The convex area runs parallel with the front surface of the bone rather than diagonally. Otherwise the surface is more like *Baluchitherium*, as there is also the same flat area on the back of the scaphoid side, but proportionally more pronounced.	No shelf in front. The convex surface runs straight across parallel with the front. On the posterior border, on the scaphoid side, there is a large area, slightly concave, and with a deep pit on the cuneiform side.
Distal articulation	In front the magnum and unciform surfaces are flat, nearly equal in area, and together make a fairly sharp crest. Behind these surfaces lie two concave facets, that for the magnum being the larger and deeper. A low ridge divides the pits.	The whole area is very slightly marked, being much flatter. The facet for the magnum occupies the whole of the posterior area.	The anterior facet for the magnum is lacking, and there is consequently no crest. The unciform facet is more concave and the dividing ridge between the magnum and unciform facets is more pronounced, otherwise the arrangement is like *Baluchitherium*.	Not essentially different from *Baluchitherium* except in the inter-proportion of the facets.

The posterior tuberosities of the Scaphoid and Lunar have about the same proportion throughout the series, except that in *Titanotherium* that of the Lunar is very flat. In the Rhinoceros and Horse the processes abut and have their surfaces in contact. In *Baluchitherium* they are entirely separate and show no pressure marks whatever.

The CUNEIFORM (fig. 18) is represented by one specimen only, which presumably is this bone as all the other carpals are known and it cannot be the cuboid or mesocuneiform (the only bones missing in the tarsus) because the facets do not comply with the requirements of these bones. Presuming then that it is the cuneiform it is somewhat peculiar when compared with the corresponding bone of other Perissodactyles. The whole bone is elongated anteroposteriorly and is compressed from side to side in the vertical plane. The area of contact with the lunar is small, and on its upper surface there is a ridge clearly marking off a smaller surface for the radius from a larger surface for the ulna. This differs from the condition found in the Rhinoceros where the ulna alone rests on the cuneiform. There is a small facet behind, placed rather towards the median line, for the pisiform. The lunar facets are somewhat Rhinoceros-like. On the lower surface the unciform facet is rather flat in front and concave behind, exactly the opposite of the condition found in the horse where the posterior facet is convex.

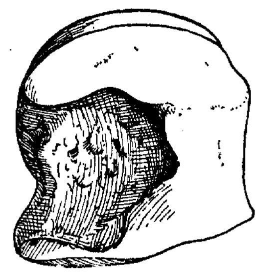

FIG. 17.—Trapezoid, of a very small animal, inner surface, × 1/2.

The TRAPEZIUM was in all probability absent from the carpus altogether. The TRAPEZOID (fig. 17) as has been pointed out by BORRISSYAK is very horse-like in general shape (identical with that of *Hipparion* according to him). It differs, however, in the area of contact with the magnum which forms a complete area from the lower border, round the front and along the top, forming a ⊃ whose arms enclose a pit. In the horse

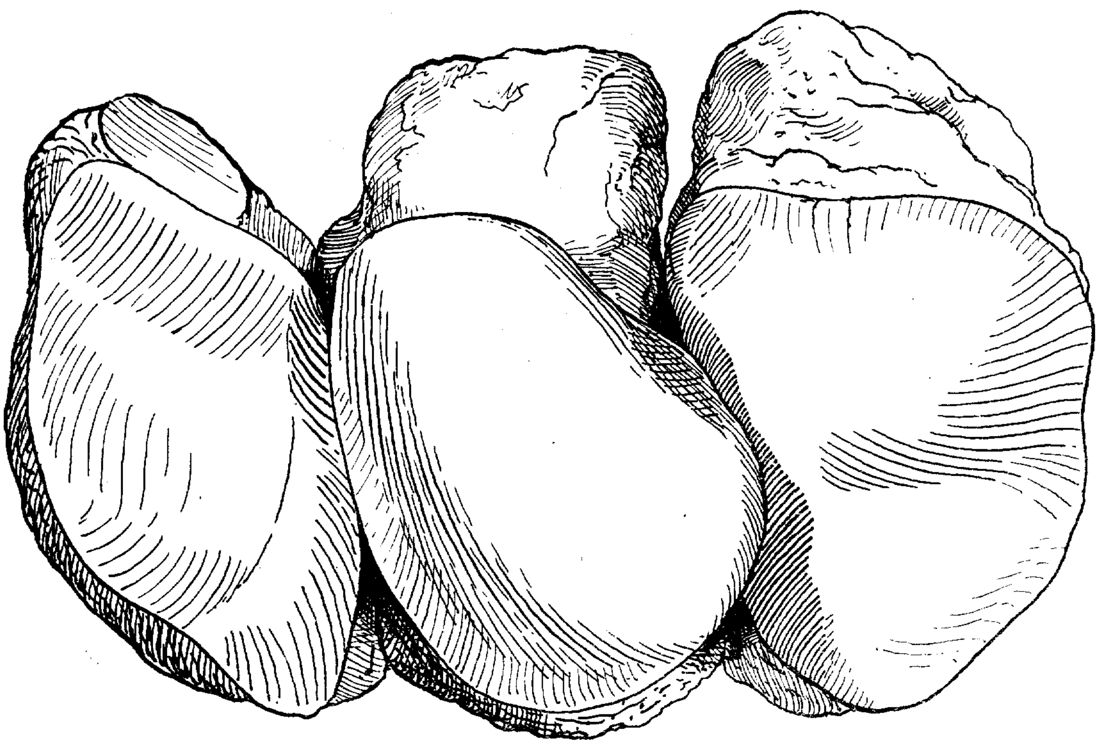

FIG. 18.—Scaphoid (the right-hand bone), lunar and cuneiform, upper surface, × 1/2.

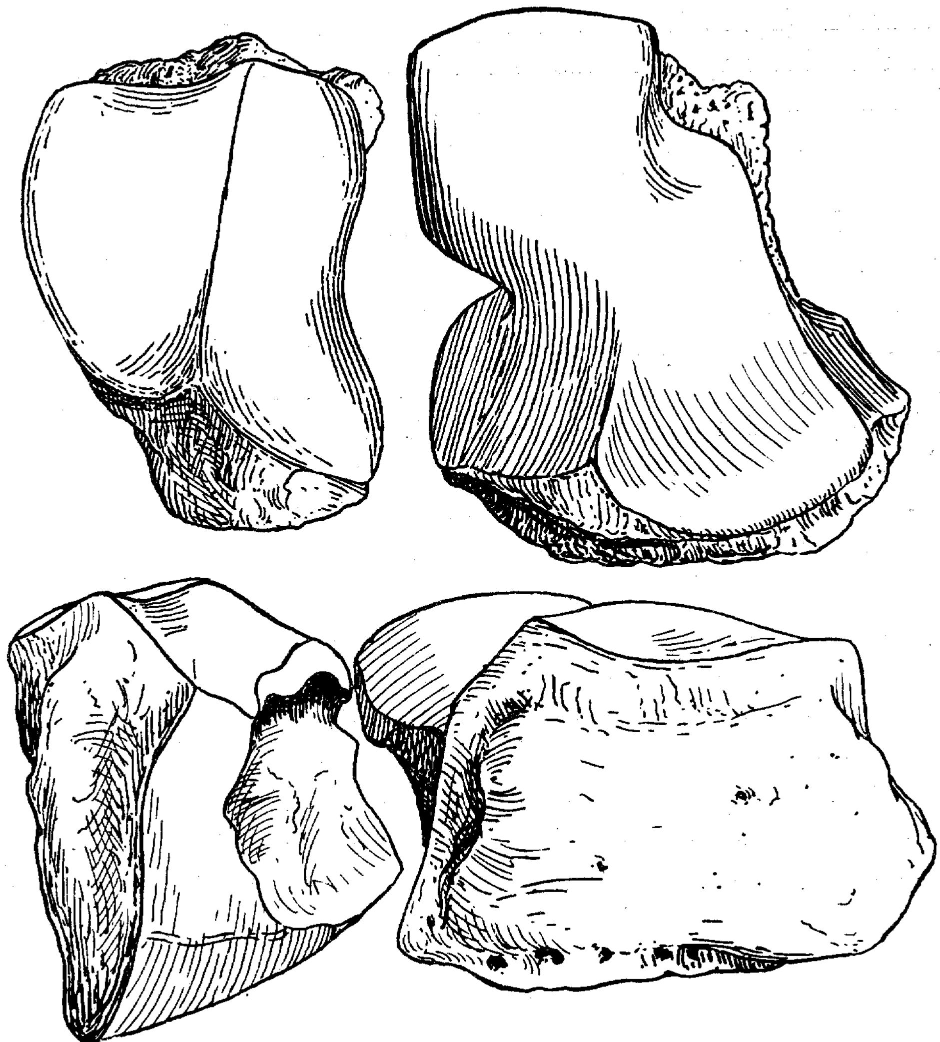

FIG. 19.—Magnum and unciform, upper and front surfaces, × 1/2.

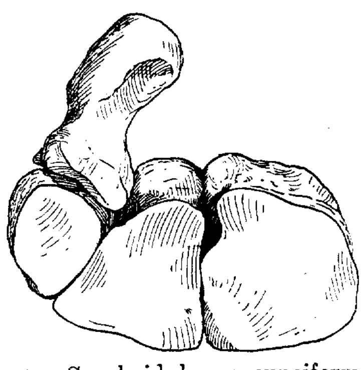

FIG. 20.—Scaphoid, lunar, cuneiform and pisiform of Horse, × 1/2.

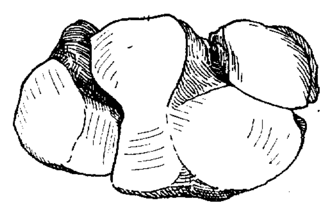

FIG. 21.—Trapezoid, magnum, and unciform of Horse, × 1/2.

(and in a specimen in the British Museum of *Hipparion* from Pikermi) this area is interrupted in front so that, instead of a pit, there is a free channel from front to back between the trapezoid and magnum.

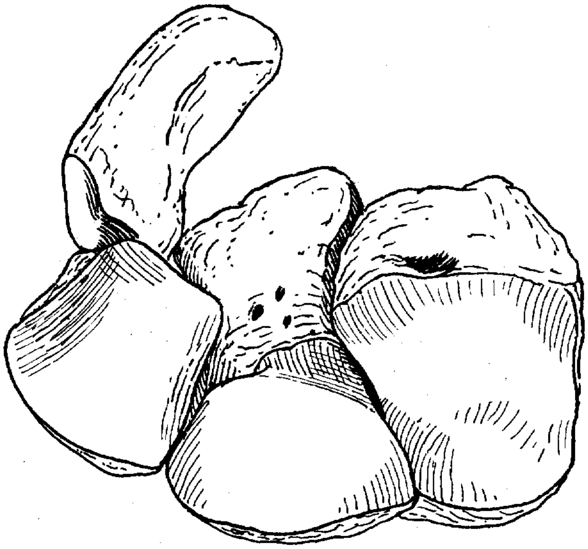

FIG. 22.—Scaphoid, lunar and cuneiform of *Rhinoceros unicornis*, × 1/2.

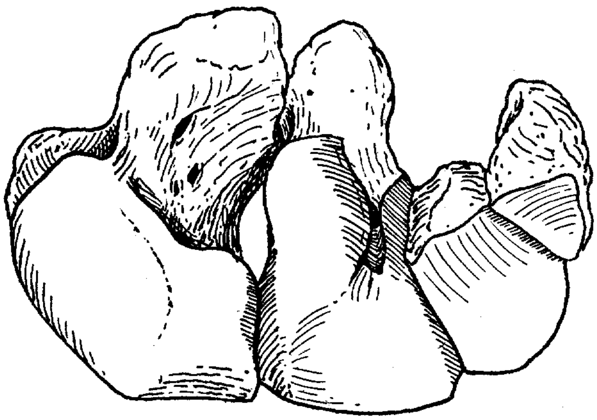

FIG. 23.—Trapezium, trapezoid, magnum, and unciform of *Rhinoceros unicornis*, × 1/2.

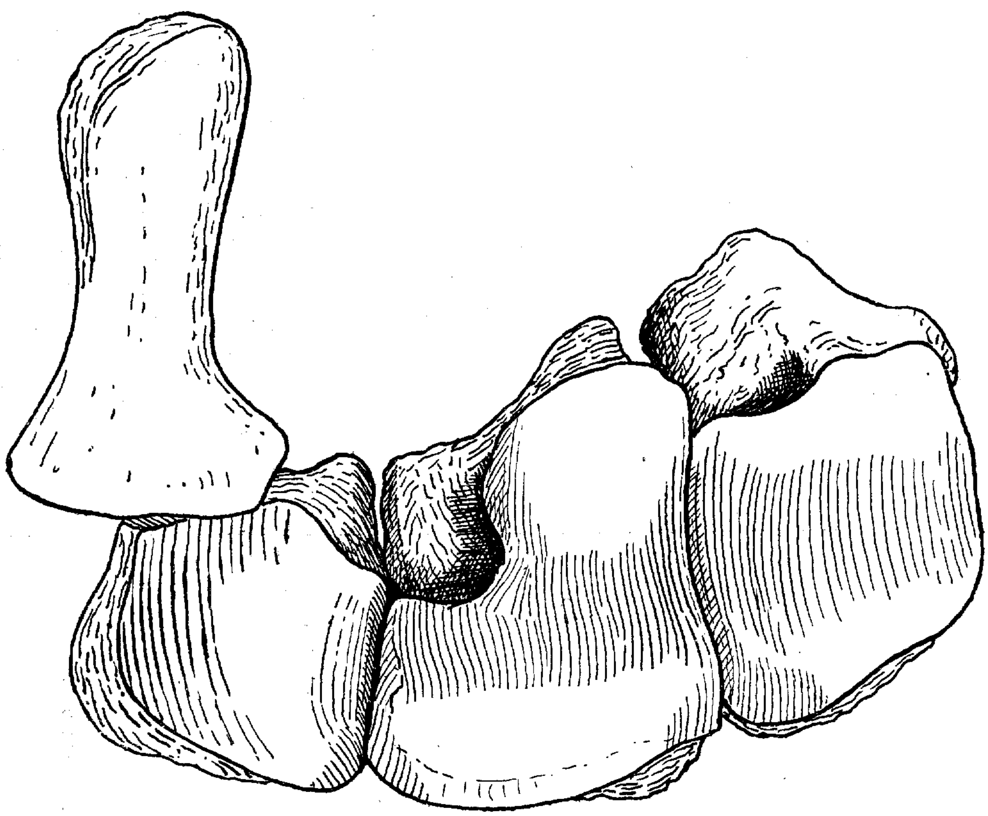

FIG. 24.—Scaphoid, lunar, cuneiform, and pisiform of *Brontotherium gigas*, from the cast, × 1/2.

MAGNUM.

	Baluchitherium (fig. 19).	*Equus* (figs. 16, 21).	*Rhinoceros* (figs. 15, 23).	*Titanotherium* (fig. 14).
Upper articular surfaces . .	The scaphoid facet is fairly flat, though somewhat concave in front and convex behind. It is triangular in shape, the apex pointing rather towards the trapezoid and is marked off from the anterior part of the lunar facet by a sharp ridge. The lunar facet consists of this front part, which is small in extent, and slopes sharply downward, to be continued at a still sharper angle as the internal unciform facet. The posterior part of the lunar facet is, roughly, a square in outline, and is convex. The bone is in contact with the unciform in front and behind, with a space in between.	The scaphoid facet is irregular in shape, somewhat round and concave. It is marked off from the front part of the lunar facet by a shallow but well-marked ridge. The front lunar facet itself is slightly concave, the posterior convex. The two lie as triangular areas in the same plane, with their apices pointing towards one another. Contact with the unciform in the anterior part only.	The scaphoid facet is concave and triangular in shape, with the apex pointing backwards. The anterior lunar facet is absent owing to the extension of the scaphoid keeping the lunar and magnum apart. The posterior lunar facet is elongate in a backward direction, and is convex. The unciform contact is in the anterior part only.	A sharp ridge divides the whole surface into equal halves, the scaphoid facet forming one-half runs straight backwards. The anterior lunar and the unciform facets are rather like *Baluchitherium*, and lie at the same angles. Contact with the unciform is in front only.
Posterior process	Is not present.	Is not present.	Long and well marked.	Well marked and sharp pointed.
Trapezoid articulation .	A large area of articulation in front which runs back along the upper surface. A smaller area lies at the back of the lower surface. A deep pit lies between these surfaces, corresponding with the pit in the trapezoid.	The magnum and trapezoid are in contact along the upper and lower surfaces, but not in front; there is thus a channel instead of a pit, as mentioned in the trapezoid.	The bones are in entire contact. There is therefore no pit or channel.	The bones are in contact along the whole upper border, but the smaller lower area is not separate.
Lower surface	Almost flat, the whole area is occupied by the middle metacarpal except for a very small facet on the internal side for the medial metacarpal.	Flat, and very like *Baluchitherium*, except that the posterior part is more sharply marked off. The facet for the medial metacarpal (splint bone) is in proportion very much smaller.	Heterocœlous. The facet for the lateral digit is marked off at a sharp angle.	Rather concave, otherwise similar to *Baluchitherium* except that the facet for the lateral digit is larger by comparison.

UNCIFORM.

	Baluchitherium (fig. 19).	*Equus* (fig. 21).	*Rhinoceros* (fig. 23).	*Titanotherium* (fig. 15).
Upper surface	A well-marked ridge divides the upper surface of the bone into a long lunar and a rather shorter cuneiform area, somewhat concave in front and convex behind, elongated in the anteroposterior direction, and turned down over the posterior border.	There is no dividing ridge, the lunar area is much the smaller. Both areas are flat, and are not turned down over the posterior border.	Divisions as in *Baluchitherium*, but the areas convex all over and considerably turned down at the posterior border. The lunar area is not so large as that of the cuneiform.	Divisions as in *Baluchitherium*, but the two areas are sub-equal, transversely elongated and turned over the posterior border only to a slight degree.
Posterior process	Weakly developed.	Fairly strong.	Strongly developed.	Strongly developed.
Inner (magnum) articular surface of process.	There is a small surface at the back when the process lies against the magnum.	The lower part of the posterior process is in contact with the magnum.	Somewhat like *Baluchitherium*.	This articular surface is absent.
Lower surface	The facet for the magnum starts at the front upper internal edge of the unciform and curves in an unbroken sweep on to the lower surface, which is a somewhat convex area. The surfaces for the medial and external metacarpals form part of this area, being marked off from one another and from the magnum facet by slight grooves. The area for the external metacarpal is as large as the combined areas of the middle metacarpal and magnum.	The lower surface here differs from all the other forms in that the facet for the magnum is absolutely vertical. The lower surface is flat, and is divided into sub-equal areas for part of the middle and the whole of the lateral metacarpals.	The medial side and the lower surface are both heterocœlous, but there is a general resemblance to *Baluchitherium*.	Conditions fairly similar to those of Rhinoceros.

THE HIND FOOT.

ASTRAGALUS AND CALCANEUM.

Owing to the absence in this collection of a cuboid and the poor condition of certain other bones it is difficult to make a satisfactory reconstruction of the hind foot.*

Of the astragalus there are three specimens, one adult and two immature (?). No free calcaneum unfortunately was found, but there is a curious and abnormal specimen of an anchylosed astragalus and calcaneum.

The astragalus (fig. 25A, B) itself is definitely Rhinoceros-like in pattern, although

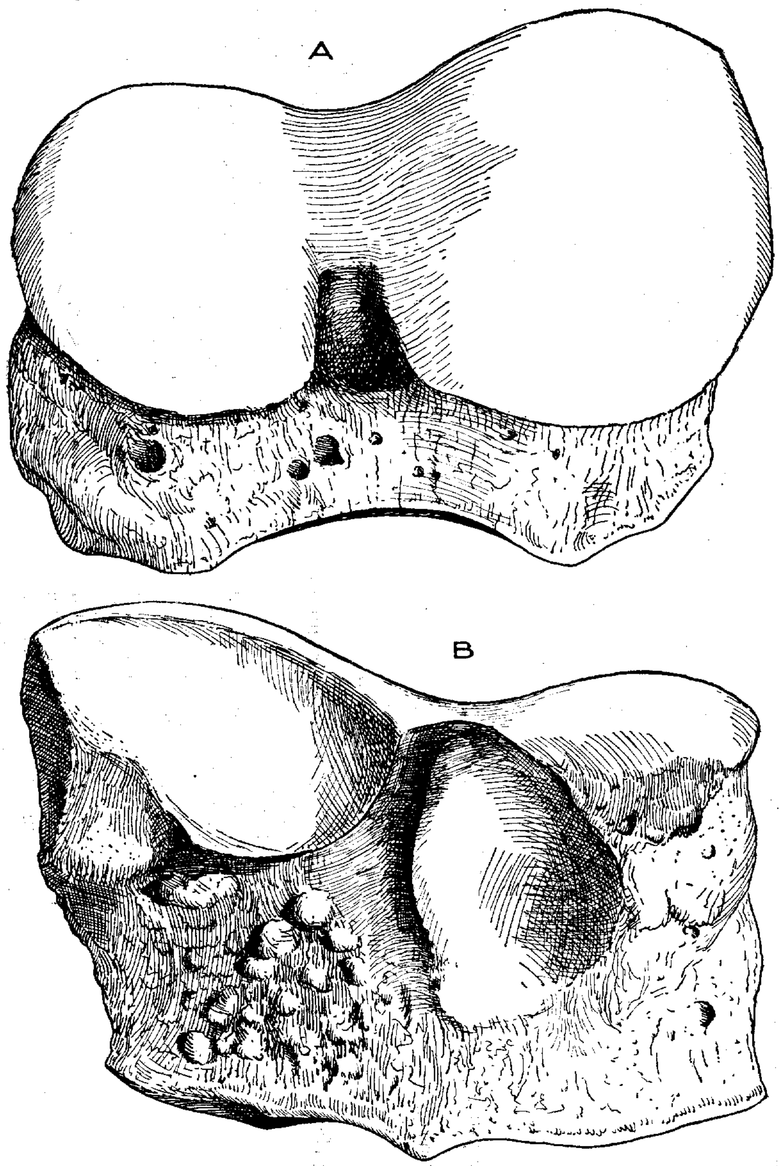

FIG. 25.—Astragalus, A, front view, × 1/2; B, posterior view, × 1/2.

* BORRISSYAK'S small figure of the complete hind foot however, to some extent, supplies the cuboid and other details.

somewhat altered by weight-adaptation, which results in a general flattening of all articular surfaces. Viewed from the front the trochlea shows that the groove runs in the median line without any lateral direction. It is wider and shallower than that of the Rhinoceros and the ridges bounding the groove are more rounded and less sharply defined. The external ridge is considerably larger and higher than the internal, the proportion being like that of the Rhinoceros and quite unlike that of the Horse.* The fibular surface is small in extent and does not reach far forward. The median malleolus of the tibia being little developed there is in consequence hardly any trace of its bearing on the inner side of the astragalus; in the Rhinoceros this is well marked.

Posteriorly the surfaces for the articulation with the calcaneum differ a little in the three specimens. In the largest the internal (superior) is very Rhinoceros-like but flatter. The external (sustentacular), however, differs in being comparatively smaller and in not reaching down to the lower surface of the bone. The inferior, which in the Rhinoceros is well marked and runs to the lower border of the sustentacular, is here not marked at all; the bone here is a little rubbed, but the facet if present could only have had a very small area and was certainly separated from the sustentacular surface. In the smaller specimen it is present though small, but is likewise quite separate from the sustentacular facet. The pit for the interosseous ligament is very deep and the area outside is much tuberculated. The lower surface is flatter than that in the Rhinoceros, but has the cuboid and navicular facets similar in general shape, though the cuboid is proportionately rather less in area than the navicular.

The two smaller astragali, which probably belong to young specimens,† are similar in general shape and proportions but differ in the calcaneal facets. One of them has the internal and sustentacular facets completely joined and the pit for the interosseous ligament hardly developed, the other occupies a position halfway between this condition and that first described. In this connection the fused bones mentioned above become of interest. The front internal part of the astragalus is broken away otherwise the specimen is complete. The astragalus itself is the same size as the smaller specimens and shows no difference from them except where masked by fusion. On the lower surface there is a distinct groove showing the respective limits of the two bones. The sustentacular facet of the calcaneum is smaller than in the Rhinoceros, and on the lower surface there is a groove, with large nutrient foramina, separating the two bones. The cuboid facet on the other hand is well developed but quite flat.

This irregularity in some of the facets may possibly be accounted for by a consideration of the probable way in which the foot was used. A comparison of the angle of

* It will be seen from the description which follows that there is in the hind foot very little similarity to the horse in any direction.

† It is on the whole less likely that they belong to adults of *Paraceratherium* whose skeletal parts are as yet unknown.

the trochlear surface with the base of the astragalus shows that in *Baluchitherium*, as compared with the Rhinoceros, there was considerably less angulation between the tibia and digits. Consequently the whole limb was more pillar-like and the impacts more vertical. The strain on the calcaneal facets would be correspondingly less and the general flattening of all facets and bones explained. Some of the facets of the foot from partial disuse have started irregularities which can even end in anchylosis, apparently without immediate disaster though all possibility of re-adaptation is now lost. From a consideration of *Baluchitherium* as a whole it is obvious that it is ultra-specialised in gigantism and fast approaching that condition when extinction becomes inevitable.

NAVICULAR (fig. 26).

There are three specimens of this bone which, except for size, do not show very marked variation. On the whole there is considerable similarity to the corresponding bone of the Rhinoceros. The astragalar facet is a shallow basin, turned up at the edge on the outer side where it must have projected beyond the lower outside border of the astragalus, and sloping downwards at the back on the inner side. The shape of the basin differs from that of the Rhinoceros in that the width from side to side is greater than the depth from front to back.

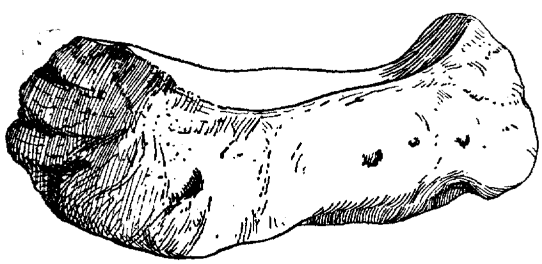

FIG. 26.—Navicular, front view, × 1/2.

In the Rhinoceros the basin, which is heterocœlous and concave from front to back, has a greater depth than width. The cuboid facets, as far as the condition of the specimens permits the statement, seem to be like the Rhinoceros but smaller in comparison, the bone being here as elsewhere flattened out by pressure. On the lower surface there is a large triangular facet for the ectocuneiform and a smaller one for the mesocuneiform. The entocuneiform facet is not present, that bone not being retained in the foot, a point of difference from the Rhinoceros. There is a much deeper pit for the interosseous ligament between the middle digit and the ectocuneiform than is to be found in the Rhinoceros.

ECTOCUNEIFORM (fig. 27 A, B, C).

There are two specimens of the ectocuneiform which show small points of difference. It is a large triangular bone of the same general shape as that of the Rhinoceros, but flatter and more compressed. The articular surfaces are also comparable, but differ in certain details, and, on the whole, the closer resemblance is that with the Tapir. The upper surface consists of a flat triangular area for the navicular, with a deep pit for the interosseous ligament, from which a narrow channel runs backwards to open just behind the cuboid facet. This pit is represented in the Rhinoceros by a shallow

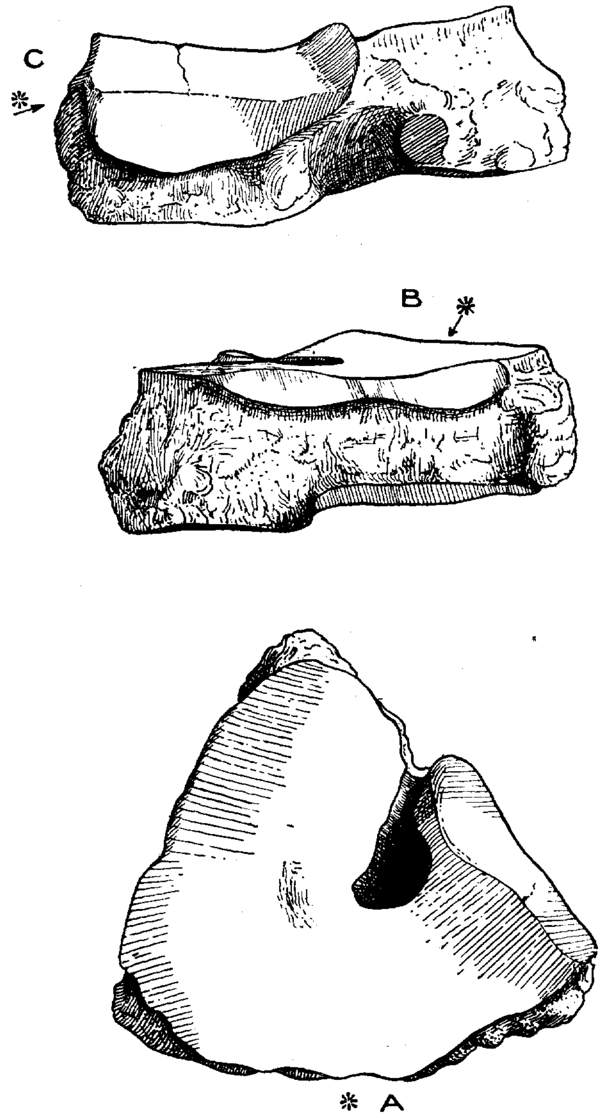

FIG. 27.—Ectocuneiform, A, upper surface, × 1/2; B, inner side, × 1/2; C, outer side, × 1/2. The * points towards the front surface.

bay, and in the Tapir by a deeper one. On the outer face of the bone, running from the front to the ligament-channel just mentioned, is a narrow oblong facet for the cuboid. This facet is barely represented in the Rhinoceros, unless it be by the small area on the lower anterior part of this face of the bone, which is shared by the cuboid and external metatarsal. In *Baluchitherium* this cuboid facet lies at an obtuse angle with the plane of the navicular surface, and is continued below by another facet for the external metatarsal, which makes with the cuboid facet an angle of the same degree of obtuseness as the cuboid facet does with the navicular. A small, circular, and entirely separate facet lies posteriorly to the cuboid facet.

This condition is very different from that of the Rhinoceros, but is approached by the Tapir, the main difference being that here the angle of the navicular and cuboid facets is acute instead of obtuse, *i.e.*, the cuboid facet faces somewhat downwards, instead of upwards as it does in *Baluchitherium.*

On the inner side there is a thin bearing along the whole of the upper edge of the bone for the mesocuneiform, while below and towards the anterior part only there is a smaller and very thin area. This lower area in the Rhinoceros is represented by two separate ones, one towards the front and one behind, which are bearings for the inner metapodial. This bone, therefore, is set up at a higher level than the middle metapodial. In the Tapir there is a thin top area which runs down and joins a lower front area. These are bearings for the mesocuneiform, while behind them, on the lower border, and separated by a shallow depression, is another area, of which the upper part lies against the mesocuneiform and the lower against the internal metapodial. In this case the bone lies at the same level as the middle metapodial. It would appear probable that in *Baluchitherium* the small thin front lower area which faces a little downwards is for the metapodial, which is thus set up, but to so very slight a degree as hardly to be noticeable, and in this respect is much nearer the Tapir than the Rhinoceros. At the same time, it must be noticed that the posterior lower part of the face of the bone shows no signs of pressure against any bone, in which it differs from both the other animals.

The lower surface is entirely taken up by a flat area for the middle metatarsal, and has a shallow ligamentary pit corresponding to the one above.

The second specimen differs from that just described, in that the facets for the cuboid and metapodial are smaller and the angles less clearly marked. On the opposite side the thin mesocuneiform facet is interrupted in the middle, and the lower facet for the metapodial has disappeared, thus bringing this bone to the same level as the metapodial.

The mesocuneiform is not present in this collection.

METAPODIALS AND DIGITS.

Of the metapodials there are two median, one of them in poor condition and one lateral. Of the median metapodials the damaged one is the larger, but its condition does not admit of much description; the other, a rather smaller bone (fig. 28), shows the following differences when compared with the corresponding bone of a Rhinoceros. The proximal surface is flat and triangular, with a shallow ligament pit on the ental side, which in the Rhinoceros is represented by a bay. The two articular surfaces for the inner metapodial are small and lie flat upon the surface of the bone, instead of being raised upon small pedicels and at an angle to one another. The distal end differs in that the median keel for the sesamoid bones is more strongly marked, and in that the surface for the digit is produced over the front of the bone to a greater extent, implying that the metapodials in life were held more upright than in the Rhinoceros, the arrangement being more nearly that of the Elephants.

The lateral tuberosities of the distal end are very little marked.

The lateral metapodial (fig. 29A, B, C) shows similar features of flatness of the proximal surface and the enlarged keel; it is narrower from side to side and deeper in the antero-posterior direction than is found in the Rhinoceros.

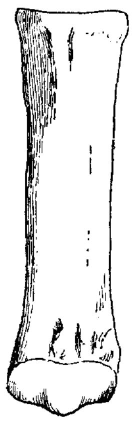

FIG. 28.—A median podial, × 1/8.

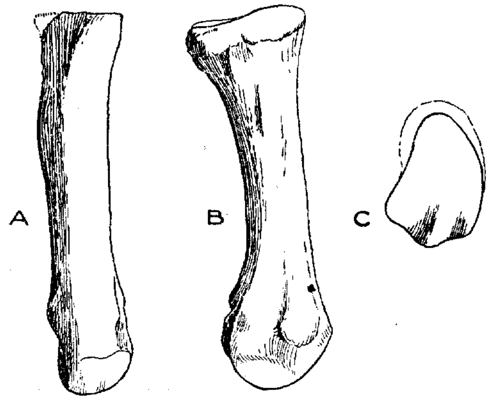

FIG. 29.—A lateral podial, A, front view, × 1/8; B, lateral view, × 1/8; C, articular surface of lower end, × 1/8.

Of the digits several examples were found. For the most part they are broad from side to side, rather narrow from front to back, and much compressed (fig. 30); like the Rhinoceros, they are concave above, but, unlike it, tend to show a convex surface below. There remains a bone (fig. 31), represented by two specimens, which is presumably the first digit of the lateral toe. If this is the case, and some support

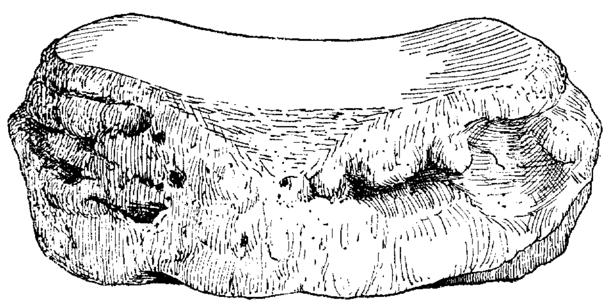

FIG. 30.—A median toe bone, front view, × 1/2.

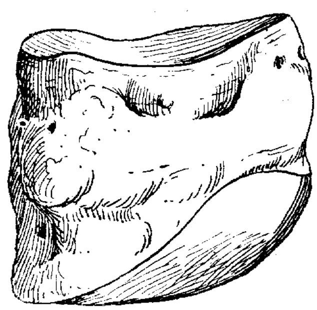

FIG. 31.—A lateral toe bone, side view, × 1/2.

for the view is given by BORRISSYAK'S small outline figure of the side of the hind foot, it differs considerably from that of the Rhinoceros, or, indeed, from any other Perissodactyle. The proximal surface is triangular and slightly concave, the distal a long, slightly convex oval; the sides of the bone are heavily roughened, and the bone is less compressed than the other digits. From the shape of the bone, it would appear that the lateral digits were rotated backwards to a greater degree than usual.

Having given these details we may now proceed to a short consideration of the feet as a whole. Here OSBORN'S admirable treatment of the evolution of the ungulate foot has proved most useful.* After making due allowance for adaptations to weight, such as the general flattening of the horizontal facets, *Baluchitherium* does not depart from the general rules there laid down for the Perissodactyle. In the section devoted to the *Hyrachyus*, *Triplopus*, *Hyracodon* series, OSBORN makes the following statement† : "There is an intermingling of rhinocerotic and equine characteristics in the teeth and feet respectively of this series, which give it an especial interest and separate it widely from both the above stocks. It has nothing in common with the tapir series either in the structure of the teeth or feet, and unlike both the tapirine and equine lines little is known of the sub-Bridger forms, and there is no parallel European phylum."

"The general characteristics of the carpus and tarsus are the vertical elongation and lateral compression of the elements of each, and the close union of the metapodials in some of the later forms which, while tridactyl, renders the foot in some forms functionally monodactyl." This, written in 1889, now reads very well as a general description of the foot of *Baluchitherium* dug up in 1911. BORRISSYAK has already emphasised the horse-like characters of *Indricotherium*,‡ stating that "the middle digit in the wrist of *Indricotherium* is enormously developed while the lateral ones are reduced to a very remarkable degree, at the same time the lateral metapodials turn off backwards and flatten out in a lateral direction, a phenomenon not observed in Rhinoceroses, and peculiar only to the monodactyl representatives of the family of Horses. In this manner we are able to say that the wrist of *Indricotherium* skipped the stage of the three-limbed extremities and made considerable steps towards the one-toed stage. In this respect it shows itself to be more highly specialised than any other specimen of the Rhinocerotidæ."

The specimens in the present collection do not allow one to go so far. The median digit is certainly enlarged, but the laterals are still important. Viewed from the front they appear thin, but this is due to their backward rotation, a point which BORRISSYAK has obviously appreciated in his specimens. This is, however, far from being monodactylism, and there is no evidence that the lateral toes were relieved of their proper share of work, a clear difference from the trend of horse evolution. There is considerable evidence, however, that the lateral metapodials were closely united to the median as, for instance, the lack of expansion at the distal end of the central metapodial, and so the three would hit the ground more or less as one, especially as they were possibly bound together in a fleshy pad. This is the *functional*, as contrasted with actual, monodactylism, a difference very clearly brought out by OSBORN.

* *Loc. cit.*, Part IV, p. 531 *et seq.*; the description and figures of the feet of *Triplopus*, p. 524; *et passim.*

† *Loc. cit.*, p. 546.

‡ The 1917 paper already cited.

Without having actually seen and handled the foot bones of *Triplopus* it is not possible to state all the resemblances and differences between the two forms, but from OSBORN's figures and description certain points are worth noting.

In the carpus the vertical diameter is slightly less than the transverse, a difference from *Triplopus* easily explained by the greater weight. There is the same rolling backwards of the lateral elements resulting in the same convex face of the whole carpus and tarsus. The lateral displacement and elongation of the metapodials is similar. The scaphoid is narrow (comparatively), and the trapezoid facet oblique. The lunar rests largely, but by no means entirely, on the cuneiform. The cuneiform is rotated backwards, and in the figure looks extraordinarily like that of *Triplopus*. It is a pity that the *trapezoid* is lacking in the earlier form, so that no comparison can be made with the horse-like bone of *Baluchitherium*.

Of the hind foot, owing to the lack of material, less can be said, but it would appear to be somewhat less horse-like than that of *Triplopus*.

While the material is as yet too scanty to admit of any definite statement as to whether the resemblances in structure between these two forms are due to adaptation, or to something deeper, they are at any rate worth bearing in mind.

(?) THE SKULL AND TEETH.

BORRISSYAK has given a description and figure* of certain teeth as belonging to *Indricotherium* which raises a very interesting and curious problem. Among them are certain large, single-cusped, and single-rooted specimens which, being found separate, he has determined partly as canines and partly as presumed upper incisors. Of these teeth, he describes the root "as exactly resembling the root of the canine in the carnivores. There is nothing like it neither among the Rhinoceroidea nor among the Tapiridæ, while the canine of the Lophiodontidæ is very near to it." They are identical, as far as can be seen, with the lower incisors found *in situ* in a lower jaw obtained by the present writer during his first expedition to Baluchistan, and described in a preliminary notice† as *Paraceratherium bugtiense*. This form is noticeable from the curious way in which the lower incisors are turned downwards like a pair of tusks. In the same notice the foot bones and vertebræ, subsequently made the types of *Baluchitherium*,‡ were mentioned, and were provisionally referred to *Paraceratherium*. In a subsequent expedition, during the following year, further lower jaws and skulls of *Paraceratherium* were found, as well as further bones and vertebræ of *Baluchitherium*.

The teeth in the skulls of *Paraceratherium* are similar to those figured and described by BORRISSYAK as belonging to his *Indricotherium*.

Since skeletal remains of a large animal, *Baluchitherium* (*Indricotherium*), are found in the same deposits in each locality as teeth of a large size, it would seem most

* *Loc. cit.*, the 1916 paper.

† 'Ann. Mag. Nat. Hist.,' Ser. 8, vol. 8, 1911, p. 712, Plate X.

‡ *Loc. cit.*, vol. 8.

natural to consider them as belonging to one another. There is, however, one difficulty that has to be surmounted before accepting this somewhat obvious conclusion.

One skull* at least of *Paraceratherium*, seeing that its teeth are worn down to the sockets, was fully grown. Its teeth are very little smaller than BORRISSYAK's series of teeth, yet the skull is in general measurements little larger than that of a large Rhinoceros (such as *R. platyrhinus*). This adult skull has occipital condyles too small for the atlas of *Baluchitherium* by 100 per cent. or rather more. This discrepancy in size seems too large to be accounted for as due to a difference of sex, though under the circumstances the possibility must not be neglected. The beds in Baluchistan have produced fragmentary skulls, teeth, and a few foot bones of more normal Rhinoceroses (*Teleoceras, Diceratherium* and an *Amynodon*-like form).† These will form the subject of a future paper when the dentition of *Paraceratherium* will be described in detail, which animal the writer is inclined still to regard as a species separate from *Baluchitherium* while fully admitting that the question is an open one.

SUMMARY.

It will be seen from the foregoing account that the evidence is not yet sufficient to place *Baluchitherium* with certainty. It shows points of resemblance to various Perissodactyles which, among themselves, are of widely divergent phylogenies. It follows, therefore, that each particular point must be well considered before deciding whether its likeness to one animal or another is due to genetic affinity or merely to convergent adaptation. The neck bones, for instance, are in some respects very Horse-like, but vertebræ are not usually of use in tracing affinity, being too liable to be masked by adaptation. The proboscidian character of the femur and in some of the other limb bones is also easily accounted for by adaptation.

In the foot bones there is a mixture of Rhinoceros- and Horse-like characters; the latter are best explained for the present as due to the tendency to functional monodactylism. The Rhinoceros characters point to a generalised and genuine connection with that group, which cannot, however, be traced in any contemporary forms, but must be sought much further back in time. Some such form as *Triplopus* is suggested as likely to throw a little light. There remains the possibility of confusion with the form described as *Paraceratherium*.

Baluchitherium, then, can be described as the only known member at the end of a series of Perissodactyles which had evolved on a tall-footed digitigrade and presumably dolichocephalic line of evolution, with an increase in size which ultimately became inadaptive; of primitive Rhinocerotine affinities, somewhat masked by adaptation to weight; the line of ancestry being as yet unknown.

* The skull belonging to the lower jaw figured in the preliminary notice of *Paraceratherium, loc. cit.*, Plate X, which was found on the second expedition.

† Forster Cooper, 'Ann. Mag. Nat. Hist.,' Ser. 9, vol. 9, p. 617.

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Measurements of Bones (in Millimetres) whose Dimensions are not already given in the Text.

Humerus—Length, 840; width of distal articulation, 230.

Femur—Length, 1200; width of distal articulation, 190; diameter of head, 190.

Patella—Width, 135.

Tibia—Length, 790; width proximal articulation, 250; width distal articulation, 250; width astragalar facets, 190.

Scaphoids, extreme measurements of length and breadth—

Specimen 1	Length, 180;	breadth, 110.
,, 2	,, 167;	,, 100.
,, 3	,, 166;	,, 90.
,, 4	,, 140;	,, 78.
,, 5	,, 125;	,, 71.
,, 6	,, 123;	,, 80.

Lunars—

Specimen 1	Length, 155;	breadth, 100.
,, 2	,, 120;	,, 75.

Cuneiform—Length, 130; breadth, 72.

Trapezoid—Length, 69; breadth, 52.

Magnum—

Specimen 1	Length, 150;	breadth, 132.
,, 2	,, 148;	,, 104.

* These will be handed over to the British Museum for incorporation with the collection.

Unciform—

Specimen 1	Length,	130;	breadth,	102.
„ 2	„	120;	„	82.
	„	115;	„	73.
	„	110;	„	73.
	„	85;	„	64.

Astragalus: (1) width across trochlea, (2) weight—

Specimen 1	Width,	180;	height,	132.
„ 2	„	141;	„	87.
„ 3	„	106;	„	90.
„ 4 (fused astragalus and calcaneum)	Width,	132;	height,	92.

Ectocuneiform: (1) width, (2) breadth—

Specimen 1	Width,	135;	breadth,	130.
„ 2	„	130;	„	120.

Navicular—Width, 147; breadth, 108.

Metapodials—

Middle	Length,	370.
Lateral	„	355.

Digits, the largest specimen found: Width, 152; breadth (antero-posterior), 83.

[*Note added November*, 1922.—Since this memoir has been set up in type a notice by Prof. OSBORN has appeared, in the September number of "Asia," of the discovery in China by Mr. WALTER GRANGER of an animal probably related to, or identical with, *Baluchitherium.* I am given to understand that the skull is nearly 5 feet long, a fact which adds some weight to the view that *Baluchitherium* and *Paraceratherium* are separate forms. The conformation of the lower jaw of the first-named animal will help to decide the point, and the full description of Mr. GRANGER's important discovery must be awaited with interest.]