XIII. *On the Appendicular Skeleton of the Primates.* *By* St. George Mivart, *F.L.S.*, *Lecturer on Comparative Anatomy at St. Mary's Hospital. Communicated by Professor* Huxley, *F.R.S.*

Received November 22, 1866,—Read January 10, 1867.

The interesting question regarding the number and value of the anatomical resemblances and differences existing between Man and the rest of the Primates, has led to complete and detailed descriptions and comparisons such as those of Professors Owen *, Duvernoy †, and Gratiolet ‡. But the valuable treatises of these authors yet leave much to be desired, because they relate only to the highest forms of the Order, and some distinctions resulting from such limited comparisons are apt to disappear, and the anatomical value of others to decrease when the survey is considerably extended.

The memoir of Professor Vrolik § gives a somewhat more extended view, and Professor Huxley ‖ has carried his observations and comparisons much further; but for the thorough investigation of the skeleton of the limbs of the Primates, nothing less than the careful examination of every bone throughout the whole series of forms is requisite, while man's peculiarities can be justly appreciated only after a similarly extensive comparison.

Dr. J. Ch. G. Lucae ¶ has recently published an elaborate paper, with careful and minute comparisons, on the limbs of Man, Apes, and Marsupials, but he confines himself almost entirely to the terminal segments of the limbs, the *manus* and the *pes* **, and besides he does not appear to have had at his disposal a sufficient supply of specimens, as the very remarkable genera *Indris*, *Loris*, *Nycticebus*, *Perodicticus*, *Arctocebus*, *Tarsius*, and *Cheiromys* are not noticed by him.

The rich collections of the British Museum and of the Royal College of Surgeons have supplied me with abundant materials, and I should be wanting in duty if I omitted to express my acknowledgments for the great facilities afforded me, at both those Institutions, for studying the skeletons therein preserved. To Mr. W. H. Flower espe-

* "Osteological Contributions to the Natural History of the Chimpanzees and Orangs," Trans. Zool. Soc., vols. i. to v.; and "Memoir on the Gorilla," 1865. † Archives du Museum d'Hist. Nat. Paris, 1855.

‡ Nouvelles Archives du Mus., 1866, vol. ii. § Recherches d'Anat. Comp. sur le Chimpansé. Amsterdam, 1841.

‖ 'Man's Place in Nature,' 1863; and 'Hunterian Lectures,' reported in Medical Times, 1864.

¶ Abhandl. Senckenb. Naturforsch. Ges., 1865, v. pp. 275 to 332, with four plates.

** On account of the ambiguity arising from the as yet unsettled connotation of the terms "hand" and "foot," I think it better in a scientific treatise to disuse them altogether, and to follow the example set by Professor Owen (in his memoir on Cheiromys) and by Mr. W. H. Flower (in the labels placed on his recent additions to the Museum of the Royal College of Surgeons), by adopting for the anterior extremity (the carpus, and all beyond it) the term *manus*, and for the homotypal posterior segment the term *pes*. The all but necessity for distinct *homological* terms for such parts is obvious.

cially my thanks are due; nor can I refrain from expressing my admiration of the liberal spirit in which the magnificent collection placed under his zealous supervision is made available to cultivators of natural science.

After considering the skeleton of each entire limb, and of every segment of each, and describing the several bones in some detail, after also giving the dimensions and proportions of these parts, I propose to consider the number and value of the peculiarities presented by the more aberrant forms, and especially by Man, and finally to enumerate some of the more obvious characters of the several groups (as deducible from their appendicular skeleton), and the relations thence derivable of such groups to each other.

The arrangement here adopted as to the families, subfamilies, and genera of the Order is as follows:—

Suborder I. Anthropoidea.

Family.				
I. Hominidæ				Homo.
II. Simiidæ	Subfamily	1. *Simiinæ*		Troglodytes.
				Simia.
				Hylobates.
		2. *Semnopithecinæ*		Semnopithecus.
				Colobus.
		3. *Cynopithecinæ*		Cercopithecus.
				Macacus.
				Cynocephalus.
III. Cebidæ	Subfamily	1. *Cebinæ*		Ateles.
				Lagothrix.
				Cebus.
		2. *Mycetinæ*		Mycetes.
		3. *Pitheciinæ*		Pithecia.
				Brachyurus.
		4. *Nyctipithecinæ*		Callithrix.
				Chrysothrix.
				Nyctipithecus.
IV. Hapalidæ				Hapale.

Suborder II. Lemuroidea.

V. Lemuridæ	Subfamily	1. *Indrisinæ*		Indris.*
				Propithecus.
				Microrhynchus.
		2. *Lemurinæ*		Lemur.
				Hapalemur.
				Microcebus.
				Lepilemur.
		3. *Nycticebinæ*		Nycticebus.
				Loris.
				Perodicticus.
				Arctocebus.
		4. *Galagininæ*		Galago.
VI. Tarsiidæ				Tarsius.
VII. Cheiromyidæ				Cheiromys.

* Since this paper was read I have had, through the great kindness of Professor Peters, an opportunity of examining a skull of the species for which the genus *Propithecus* was instituted. I am now convinced that the three above-mentioned genera of *Indrisinæ* constitute but a single natural genus—*Indris*. See Proceed. ool. Soc. 1867, p. 247.

Specimens have been examined of all the above genera except Propithecus, Hapalemur, Microcebus, and Lepilemur, no skeleton belonging to any of these genera existing, to my knowledge, in this country. There is, however, every reason to believe that the skeleton of Propithecus closely resembles that of Indris, and the other three are probably very similar to Lemur or Galago.

The Pectoral Limb.

The entire pectoral limb (measured from the summit of the head of the humerus to the distal end of the longest digit) attains its greatest absolute length in the Gorilla and Orang, after which come the Chimpanzee and Man. If the manus, however, be excluded, the rest of the limb of Man exceeds that of the Chimpanzee in the specimens examined.

The proportion borne by the entire limb to the spine, measured as before mentioned, is greatest in Hylobates, namely, as much as about 203, or even 222, to 100. Next come Tarsius, in which it is about 187 to 100; Ateles, 174; Simia, 170; the Gorilla, 150; and the Chimpanzee, 142 *. The rest range from 128 (Cheiromys) to a little less than the spine in length (Man being about 107 to 100), except certain forms in which the proportion is much less; thus in Chrysothrix and Hapale it is less than 85 to 100, while in Perodicticus and Lemur it is under 80, and in Arctocebus as little as 75·3 to 100.

The length of the limb without the manus, compared with that of the spine, is again by far greatest in Hylobates, then in Tarsius, Ateles, Simia, and the Gorilla; in all the rest, except the Chimpanzee, the pectoral limb without the manus is shorter than the spine, and shortest of all in Perodicticus.

Scapula.

This bone throughout the Order has a well-developed spine, and more or less large acromion and coracoid processes.

Estimating its size by a line drawn from the anterior (in Man upper) end of the glenoid surface to the posterior (in Man inferior) vertebral angle, this bone is seen to attain its greatest absolute size in the Gorilla. Man follows next, with the Chimpanzee and Orang, which two Apes more nearly equal him in the size of this bone than he does the Gorilla.

This dimension, compared with the length of the vertebral column, is again greatest in the Gorilla, namely, about 35·5 to 100; then in the Orang and Chimpanzee about 30, and in the Gibbons and Ateles about 25. In Man it is about as 22·8 to 100, and in most of the other forms it is less, and least in Perodicticus, namely about 15·6.

* Dr. Lucae, *loc. cit.* p. 279, makes the proportional length of the limb greater in the Chimpanzee than in the Gorilla, as also does Dr. G. M. Humphry (Human Skeleton, p. 106). In all the adult, or nearly adult specimens in the Museum of the Royal College of Surgeons I find the pectoral limb longer compared with the spine in the Gorilla than in the Chimpanzee.

As to the relative proportions of the several margins of the bone, if the axillary margin be taken as a standard, then the vertebral border exceeds it by a fourth or a fifth of its (the axillary margin's) length in Man and Perodicticus. It considerably exceeds it in the Gorilla, and decidedly so, though to a less extent, in the Chimpanzee and in Arctocebus. In Nycticebus the two dimensions are about equal, but in other forms the vertebral margin is the shorter, though only slightly so in Mycetes, Ateles, and Pithecia, and sometimes in Cynocephalus. In the Orang and Gibbons it is about as 86 or 71 to 100, while in Lemur and Galago the vertebral margin is only about half the length of the axillary one, and the proportion is even less in Tarsius.

If the anterior (in Man superior) margin be compared in length to the axillary one, estimating it by a straight line drawn from the glenoid surface to the anterior vertebral angle, it will be found to attain its greatest relative size in the lowest Simiidæ, being in Cynocephalus sometimes as 107·6 to 100. Its proportional length is also great (91) in Perodicticus; in the rest it varies from near this to 61 (Man and Indris about 64), except in the Simiinæ and Ateles, where it is less, being least in the Chimpanzee, *i. e.* sometimes only as 40 to 100.

The proportion borne by the anterior margin (superior in Man) to the vertebral one is greatest in Tarsius, more than 2 to 1; but it is more or less in excess also in Cheiromys, the Lemurinæ, and the lowest Simiidæ, Nyctipithecus, and Chrysothrix. The anterior margin is the shorter of the two in Man, Ateles, Mycetes, Pithecia, Indris, the Nycticebinæ (except Loris) and the Simiinæ, and is shortest of all in the Chimpanzee.

The posterior vertebral angle is most acute in Troglodytes niger, where it is sometimes as small as 22°. In the other Simiinæ and in Ateles, it is more acute than in Man, in whom it is about 35° or 40°; but in the rest of the Order it is more obtuse, even reaching to 75° in some of the lowest Simiidæ.

The anterior vertebral angle is most marked in Man *, the Simiinæ, Ateles, Pithecia, the Nycticebinæ, Tarsius, and Cheiromys. In the other forms the vertebral margin passes into the anterior one without any marked prominence (Plate XI. fig. 2).

The direction of the spine of the scapula, with regard to the blade of that bone, may perhaps be best estimated by the angles it forms with the vertebral and axillary margins.

The angle formed by it with the vertebral margin is greatest in the Chimpanzee, the Siamang, and in Ateles, where it amounts to about 125°, or even rather more; and in Galago and Lemur, where it is about 120°. In the rest of the order it ranges between this and a right angle (Man being about 95°), except in some of the lower Simiidæ, where it falls below a right angle, being sometimes in Cynocephalus as small as 74°.

* In the Museum of the Royal College of Surgeons are skeletons of a male and female (Nos. 5357 and 5357A) from South Africa, in which this angle is rounded off, as has been noticed by Professor Owen, Osteol. Catalogue, vol. ii. p. 832. In another female of the same race, however, this angle is exceedingly produced.

The angle formed by the spine of the scapula with the axillary margin of that bone is most obtuse in Man, namely about 55° or 60°. It approaches the human proportion most closely in the Orang, aged Semnopithecinæ, Mycetes, Pithecia, Nycticebus tardigradus, and in Perodicticus, in which it is 40° or upwards; in the rest it varies between this and 20° (it being sometimes as small as 20° in the Chimpanzee, Ateles, Lemur, and Cheiromys), except in Galago, where it may be as small as 17°, and in Hylobates, where it is at its minimum, namely 15°, or even sometimes only 12°.

The glenoid surface is broadest in proportion to its antero-posterior (vertical) extent in Man and Ateles, namely, about 73 or 75 to 100. In Troglodytes it is about 68 to 100; in the rest of the Anthropoidea it is less; but the breadth always exceeds half the length; this is not the case in some Lemuroidea, *e. g.* Indris, Nycticebus, and Cheiromys; and in the Nycticebinæ the anterior part becomes remarkably twisted inwards towards the midline of the body, and the long axis of the glenoid surface forms an angle with the prevailing plane of the blade of the scapula. The angle formed by this (glenoid) surface with the axillary margin varies generally between 130° and 144°. In the Simiinæ, the Pitheciinæ, Tarsius, Mycetes, Ateles, and Hylobates it is 125° or less, sometimes in the last-mentioned genus being as small as 93°.

The size of the supraspinous fossa, as compared to the infraspinous one, attains its maximum in the Gorilla and Mycetes (Plate XI. fig. 4), then in Hylobates and Arctocebus. The Orang, Man, the Pitheciinæ, Nycticebus tardigradus, Tarsius, and Cheiromys have the supraspinous fossa exceptionally small (Plate XI. figs. 5 & 6).

The anterior (in Man superior) margin is often much produced, so as to be strongly convex forwards *, and to much increase the size of the supraspinous fossa. This production does not exist in Man † or in the Simiinæ, in which this margin is more or less concave, as also in Ateles (external to the suprascapular foramen), Pithecia, and Nycticebus. In the other forms the anterior margin is generally more or less decidedly convex, and attains its maximum of convexity in aged Cynocephali (Plate XI. fig. 2).

A suprascapular notch is not well defined in the great majority of the order, only, indeed, in Man, the Chimpanzee, and the Cebidæ, except Pithecia and Chrysothrix; but in some of the last-named family (*e. g.* Ateles ‡ and Mycetes) it is constantly, and in others (*e. g.* Lagothrix) it is often so enclosed by bone as to become a foramen. In Mycetes a peculiar flat process § springs from the anterior surface of the bridge of bone

* That this prominence really answers to the anterior margin of Man, and is not produced by a bending downwards and forwards of the anterior vertebral angle, is shown by the specimens numbered 4756 and 4822A in the Museum of the College of Surgeons, in which the true anterior vertebral angle is distinguishable. Another reason for this determination is that, in Cynocephalus, Cercopithecus, and Lemur, the *levator anguli scapulæ* is not inserted into the convex prominence, but only extends forwards a little in front of the vertebral end of the spine, while the *omohyoid* is inserted into the projecting part of the convex prominence.

† Except the two South-African skeletons in the Museum of the Royal College of Surgeons, in which the anterior margin is as strongly convex as in Macacus (see Plate XI. fig. 1).

‡ De Blainville, 'Ostéographie,' Cebus, p. 12.

§ Mentioned by De Blainville, 'Ostéographie,' Primates, Cebus, p. 16.

bounding this foramen anteriorly, a process existing in no other genus (Plate XI. fig. 4*x*).

The supraspinous fossa is almost always deepest, from before backwards, at its vertebral end. Not so, however, in the Orang *, and scarcely so in Pithecia.

The axillary margin, apart from the production for the *teres major*, is generally straight, especially in Troglodytes, Hylobates, Ateles, Mycetes, Loris, and Nycticebus javanicus. It is markedly concave in Perodicticus and Nycticebus tardigradus (Plate XII. fig. 1, and Plate XI. fig. 6); on the other hand, it is convex in Simia and Indris. This margin is generally more or less grooved longitudinally, but only in Indris is this groove so placed as to be visible on the dorsum of the scapula.

The surface for the *teres major* projects out very strongly in the lower Simiidæ, Cebus, and Chrysothrix. On the other hand, in the Simiinæ, Ateles, Indris, and the Nycticebinæ it is less marked than in Man, and, indeed, in Indris, Loris, and Nycticebus it does not project at all (Plate XI. fig. 6).

The vertebral margin is generally more or less convex, but sometimes in Man, the Gorilla and Orang, Ateles and Chrysothrix, it presents a sigmoid curve. Sometimes it is nearly straight, as in Indris; sometimes it is very strongly convex, as in Perodicticus (Plate XII. fig. 1).

The convexity of the middle part of the infraspinous fossa, which is present in Man and, more or less, in the Simiinæ, does not generally exist. In Mycetes a projection, like a faintly-marked second spine, traverses the outer surface of this fossa midway between the spine and the axillary margin.

The subscapular fossa is particularly deep in Hylobates; in Mycetes it is traversed by strongly-marked ridges, in Indris its posterior part is strongly convex.

The spine generally extends from quite the vertebral margin to a point more or less near the border of the glenoid surface. In the Gorilla, however, it rarely attains the vertebral margin†, and it scarcely does so in Hylobates, where the depth of the spine subsides with great rapidity, as also in Ateles and Nycticebus javanicus.

The superior (in Man posterior) end of the spine is almost always much nearer to the anterior than to the posterior end of the vertebral margin; but in the Chimpanzee it is (generally at least) nearer to the latter, and in Hylobates, alone of all primates, it is considerably nearer to the latter than to the former. In the Gorilla, Ateles, and Arctocebus it is more remote, relatively, from the anterior end of the vertebral margin than in Man; in all the others, including Simia, it is relatively nearer to it. A smooth, flat, triangular surface at the vertebral end of the spine, and extending thence downwards (forwards in Man) along its margin for a greater or less extent, exists in Man, the Orang, Mycetes, Loris, and Arctocebus.

The spine, except at its acromial end, always stands out more or less at right angles with the outer surface of the blade of the scapula, but sometimes it inclines forwards over

* Owen notices this condition of the supraspinous fossa in the Osteological Catalogue of Coll. of Surg., vol. ii.

† Noticed by Duvernoy in Archiv. du Mus. tome viii. p. 40.

the supraspinous fossa; sometimes it is produced backwards over the infraspinous one It is much antroverted in Simia * and Nycticebus, and rather so in Ateles, Brachyurus, Callithrix, Chrysothrix, and the other Nycticebinæ. On the other hand, in Lemur, Galago, and Tarsius, and also in Nyctipithecus, it is more or less produced over the infraspinous fossa.

Generally the spine approaches very nearly to the border of the glenoid surface, but it remains rather distant from it in Man and the Chimpanzee, the Orang and Ateles, and still more so in the Gorilla and Hylobates.

The spine also may or may not closely approach the axillary margin towards the glenoidal end of the latter. It does so in the great majority of forms; but in Man, Perodicticus, Pithecia, Loris, and Nycticebus it recedes from it so as to produce a greater width in the infraspinous than in the supraspinous fossa at that part. In the Orang and Mycetes it recedes also, and would produce a similar predominance of the infraspinous fossa but for the peculiar development of the supraspinous fossa which alters the proportion. The two fossæ are about equal in breadth, near the border of the glenoid surface, in the Gorilla, Indris, and Arctocebus; in all the others the supraspinous one is in excess (except Tarsius and Cheiromys), especially in Cebus, Chrysothrix, and the lower Simiidæ.

The base of the spine is generally grooved behind (below in Man) at its glenoidal end, most so in Cynocephalus and Mycetes. In Man, the Simiinæ, Ateles, Indris, Loris, Tarsius, and Cheiromys, this groove, as far as I have seen, is absent.

The acromion is long and narrow in Simia, Ateles, Mycetes, Pithecia, Chrysothrix, and Loris. It is short and ends very bluntly in the Semnopithecinæ and Cynopithecinæ, especially the latter (Plate XI. fig. 2). Sometimes the acromion expands, so as to send back a metacromion-like process, before reaching its distal end. This is the case in Man, Nyctipithecus, Hapale, and Troglodytes, and sometimes in Hylobates, and also in Lagothrix, Lemur, and Galago. In the two last-mentioned genera, unlike the higher forms, this expansion projects backwards over the infraspinous fossa, instead of over the head of the humerus. The expanded part is very large, and it is concave externally.

The coracoid process is large in Man and in all the Simiinæ, Ateles, and the Lemuroidea. It is short in Mycetes and the lower Simiidæ, especially in Cynocephalus (Plate XI. fig. 3). It advances much forward at its distal end in Man, the Simiinæ, Ateles, and some of the lower Cebidæ (*e. g.* Callithrix), and in the Lemuroidea. In the others its distal end scarcely, if at all, advances in front of the glenoid surface.

The ridge or process for the attachment of the coraco-clavicular ligament is *very* little marked in Man, the Orang and Gorilla, Lemur, Loris, and Cheiromys. It is very small, though distinct, in Indris, moderate in the Chimpanzee and Hylobates, and larger in the other forms, though in Mycetes it is small, apart from the peculiar flat process of that genus, with which process it comes ultimately to unite.

* Mentioned by Professor Owen, Trans. Zool. Soc. vol. i. p. 364, and by Vrolik, Cyclop. Anat. & Phys. vol. iv. p. 203.

In Ateles and Lagothrix, with a suprascapular foramen, it is of course large, but as compared with the rest of the coracoid, it attains its maximum in the lower Simiidæ, in some of which it sometimes almost equals in size the latter (Plate XI. fig. 3, *a*, *b*). It is sometimes well developed in the Nycticebinæ.

The point of attachment for the long head of the *Biceps* becomes in many a prominent tubercle. This is particularly developed in the lower Simiidæ and the Nycticebinæ, and rather so in the lower Cebidæ. In Simia it is much more developed than in Homo and Troglodytes, and more so in Ateles than in Hylobates, in which last it is peculiar in projecting rather over the infraspinous fossa than over the glenoid surface.

When the scapula is so placed that the long axis of the glenoid surface is vertical, if that surface be placed opposite the eye of the observer, then the acromion process generally does not rise nearly so high as the summit of the coracoid. In Simia, Lemur, and Galago, however, it about equals it, and almost always exceeds it in Man, Troglodytes, and Hylobates, and sometimes in Ateles, and, indeed, sometimes also in Lemur. In the Nycticebinæ it is much below it, because of the peculiar production inwards of the summit of the glenoid surface in that subfamily (Plate XII. fig. 2).

The approximation of the end of the acromion to the prolongation upwards of a vertical line traversing the long axis of the glenoid surface is very close in Man, the Simiinæ, Ateles, and Mycetes, but it diverges widely in the other genera.

The extremity of the coracoid diverges from the glenoidal margin in Man and the Lemuroidea (Plate XII. fig. 2); it approaches it much more nearly in the other Anthropoidea.

The Clavicle.

The absolutely largest clavicle of the Order is that of the Orang, and then follow those of Man and the Gorilla.

Its relative length, as compared with that of the vertebral column, is greatest in Hylobates * and Simia, in which genera only it exceeds one-fourth the length of that column. The proportion exceeds one-fifth in Man and Troglodytes, and does not fall much below in Lagothrix, Ateles, and Mycetes. In most other forms it is as about 14 or 16 to 100, but in Colobus the Nyctipithecinæ, Hapale, Arctocebus, Lemur, and Indris, it is about an eighth or less; in Lemur being sometimes as little as 9·7 to 100.

The length of the clavicle, in proportion to that of the scapula (the latter being measured from the anterior end, or summit, of the glenoid surface to the posterior vertebral angle), is in excess (111·8 to 100) only in Hylobates. It is next longest in Simia and Man, where alone it is nine-tenths the length of the scapula. It is shortest in the lowest Simiidæ, Hapale, Lemur, and Tarsius, in all of which it but little exceeds half the length of that bone.

This bone is of very exceptional slenderness, in Mycetes † its breadth, near the middle,

* Its unusual length in Hylobates is noticed by Prof. Owen, Comp. Anat. of Vertebrates, vol. ii. p. 544.

† As remarked by De Blainville, *loc. cit.* Cebus, p. 16.

being only about one-twentieth of its length (Plate XII. fig. 3). It is also narrow in proportion to its length in Hylobates and Simia.

It is very broad relatively in Troglodytes, the Cynopithecinæ, Lemur, Perodicticus, Arctocebus, Tarsius, and Cheiromys, where its thickness near the middle is about equal to one-tenth of its length.

The amount of expansion of the acromial end is liable to considerable individual variation, but it appears to be greatest in Man, the Simiinæ, and Ateles; on the other hand, it is remarkably small in the Nycticebinæ.

The expansion of the sternal end is subject to even greater variation. In Simia, Mycetes, the lower Cebidæ, and Lemuroidea it often exceeds the acromial end in breadth.

A sigmoid vertical (in Man horizontal) curvature is not generally well marked; it is most so in Man, and next perhaps in Ateles, some other Cebidæ, and the Nycticebinæ.

The sternal vertical (in Man horizontal) curvature, concave backwards, is so extended in some forms as almost to obliterate the acromial curve. This is the case in many Lemuroidea and, sometimes at least, in Hylobates. On the other hand, the sternal curvature is much less than in Man, even in Troglodytes and Simia, and in the lowest Simiidæ it disappears, as also in Indris.

The acromial vertical (in Man horizontal) curvature, concave forwards, is more constant, only disappearing in those forms, above referred to, in which the sternal curvature is so extensive. It is very strongly marked in the Nycticebinæ and in the Indrisinæ, but in no other Lemuroidea.

The antero-posterior (in Man vertical) curvature is generally slight; most marked perhaps sometimes in Ateles. It is this curvature which gives a sigmoid appearance to the clavicle in Lemur and Cheiromys.

The tubercle and ridge for the attachment of the coraco-clavicular ligament are generally at the margin of the bone, or nearer to it than in Man.

Very commonly there is no distinct process or ridge other than the superior (in Man posterior) margin of a subclavicular fossa, as is the case in the lower Simiidæ. There is, however, a marked tubercle in Troglodytes, and a large process in Simia and in Ateles and Logothrix. It is faintly marked in Mycetes and Indris.

The acromial end of the bone has its anterior (in Man superior) surface almost always more or less convex, but there is a marked concavity there in Hylobates.

The posterior (in Man under) surface of the acromial end is convex and roughened in Man *, and more or less so in the Simiinæ; in all the others, except the Nycticebinæ, it is concave, and in the lower Simiidæ this concavity becomes a very deep fossa. In all the Simiidæ other than the Simiinæ this part is close to the acromial end of the bone, but in the Simiinæ the clavicle is more prolonged outwards, and most so in the Siamang. In Man, however, this prolongation is carried still further.

Rarely, as in Simia, there is a very prominent deltoidal ridge. Sometimes a distinct

* In a skeleton of a male African negro (No. 5372 in the Museum of the College of Surgeons) there is a distinct, though small, subacromial fossa. This is wanting in all the Boschismen.

prominence marks the attachment of the costo-clavicular ligament, but this is very inconstant.

The Humerus.

This bone, throughout the order, presents the same main features, the same fossæ and prominences as those existing in Man. It is absolutely longest in the Gorilla and Orang; Man, the Siamang, and the Chimpanzee successively follow as regards this dimension.

Its length, as compared with the spine, is, as might be expected, greatest in Hylobates, namely, as 70 or 80 to 100. In the Gorilla and Orang it is from about 60 to near 65 to 100; in Ateles about 60; in the Chimpanzee and Lagothrix about 53; in Man about 47; and in the bulk of the order from between 45 and 30 to 100. In Indris, Lemur, and Perodicticus it is still shorter, though still more than a quarter the length of the spine *.

Compared with the scapula (the latter being measured, as before, from the anterior end of the glenoid surface to the posterior vertebral angle) it is nearly three times as long in Hylobates, considerably more than twice in Ateles, Lagothrix, and Loris, and slightly more than twice in Man, Cercopithecus, and the Pitheciinæ. All the rest have it less than twice as long (unless possibly sometimes in Simia); and in Hapale, Galago, and Tarsius its length is less than once and a half that of the scapula.

The breadth of the middle of the shaft to the length of the bone is mostly as between 6 and $7\frac{1}{2}$ to 100. In most Cynopithecinæ, Perodicticus, Tarsius, and Cheiromys it is more than 8; on the other hand, in the Pitheciinæ, Loris, and Arctocebus it is between 5 and 6, less than 5 in Ateles, and less than 4, at least sometimes, in Hylobates.

The width of each extremity of the bone is greatest, relatively, in Cheiromys and least in Ateles and Hylobates. But the width of the proximal part (between the tuberosities) is very great, relatively, in Cynocephalus, and of the distal portion, in Galago, Perodicticus, and Tarsius.

The head of the humerus is generally less wide than the extreme width of the tuberosities; but in the Gorilla they are about equal, and sometimes in Simia † and Ateles, and always, apparently, in Hylobates, the head is the wider, being therefore at its relative maximum.

The shaft is often almost quite straight, as in Indris; often it is curved, as in Man and Lemur; in some it is somewhat convex forwards, as sometimes in Hylobates.

The articular surface of the head is always directed backwards and inwards ‡, but in Lemuroidea it is almost exclusively backwards, while in Man it is almost as exclusively

* The bone is measured from the summit of the head to the bottom of the ulnar margin of the trochlea.

† De Blainville says of the head of the humerus in the Orang, it is "surtout singulière par son enormité, son diamètre étant bien supérieur à celui de la tête du fémur" (*l. c.* p. 30).

‡ Professor Huxley, in his Hunterian Lectures for 1864, called attention to the greater backward direction of the head of the humerus in the lower Apes as compared to its condition in the Simiinæ and Man. See 'Medical Times' for 1864, vol. i. p. 672.

inwards. In the other Anthropoidea it is intermediate, approximating to Man in the higher forms, though still differing considerably from him.

The tuberosities often project upwards slightly above the articular head, as in the Cynocephali, and very slightly in Cheiromys. Generally they are about on a level with its top, or slightly below it, but they are decidedly below it in Lagothrix and Ateles, and still more so in Simia and Hylobates.

The insertion of the *infraspinatus* is generally very marked, especially in Indris. There is sometimes a projecting tubercle for the insertion of the *teres minor*.

The ulnar tuberosity is almost always so placed as to hide the neck of the bone when its front surface is looked at, the long axis being vertical. This is not the case, however, in Man, nor in Hylobates, the Chimpanzee, nor sometimes Ateles. Very often not only the neck but a great part of the head is also hidden by it, as in the lower Simiidæ and Cebidæ, Hapale, Lemur, Indris, Tarsius, and Cheiromys. In Indris this tuberosity is bent backwards in a peculiar way (Plate XII. fig. 6). In Cheiromys it is almost as large as the radial one.

The bicipital groove is sometimes more or less strongly overlapped by its lateral margins. It is much so in the Simiinæ, especially in the Chimpanzee, in which it is sometimes spanned by a bridge of bone *.

The radial border of the bicipital groove attains its maximum of development in the Lemuroidea, especially in Indris and Perodicticus, but it is also very prominent in the Cynocephali (Plate XII. fig. 4). Its ulnar border is generally faintly marked.

The surface for the insertion of the deltoid is generally more or less defined by the radial margin of the bicipital groove on one side, and by a ridge (giving origin to the external head of the triceps) on the other. It attains its maximum in the Cynopithecinæ (Plate XII. fig. 4).

The position of the foramen for the nutrient artery presents even individual variations, being at, above, or below the middle of the bone; its direction, as far as I have observed, is always distad.

The supinator ridge is generally well developed, especially in Cynocephalus, Cebus, Hapale, Lemur, Perodicticus, and Galago; but above all in Cheiromys and Microrhynchus. In Man and the Simiinæ it is only slightly developed.

The external condyle is distinct in Man and the Simiinæ, being more prominent in them than in him; and it is also marked in Indris (Plate XII. fig. 6), Loris, Nycticebus, and Perodicticus. In the other genera it is closely applied to the capitellum, and in all of them, except Ateles and Lagothrix, looks more or less entirely outwards instead of forwards.

The internal condyle projects inwards and more or less backwards. It is least backwardly directed in Man, the Simiinæ, Hapale, and Indris (Plate XII. fig. 6). In almost all the Cebidæ (Pl. XII. fig. 5) it is so bent downwards that its extremity is quite or

* As in a mounted specimen in the Osteological Collection of the British Museum.

almost as low as the margin of the innermost border of the trochlea; it is also very much bent down in Lemur, Tarsius, and Cheiromys.

A supracondyloid foramen is only present in the Anthropoidea, in Cebus, the Pitheciinæ, Chrysothrix, Callithrix, sometimes in Nyctipithecus, and sometimes in Hapale *; on the other hand, it is present in all the Lemuroidea except Arctocebus.

The surface of the humerus between the internal condyle and the innermost border of the trochlea extends in front of and behind that condyle in all the Anthropoidea. This surface is largest relatively and absolutely in Man and the Simiinæ, where it extends in front of, beneath, and behind the condyle, though in Hylobates it is largely developed only in front of it. In the lower Simiidæ its posterior part either disappears or only exists as a very narrow groove overlapped by the condyle. In the Cebidæ this surface is smaller, and scarcely ever projects below the end of that process. In Indris and Cheiromys it is not developed in front of the condyle, but in the other Lemuroidea it is developed both in front of it and behind it, and pretty equally so in the Nycticebinæ.

The coronoid fossa is generally shallower in the Lemuroidea than in the Anthropoidea. A perforation extends into the olecranal fossa in some. This is very large and constant in Loris, but it is also present in Troglodytes † and Simia, and sometimes in Hylobates, Man, Cercopithecus, Macacus, and Arctocebus.

The olecranal fossa is sometimes deep, as in the Simiidæ, especially the Cynopithecinæ. It is less so in Man, and still less so in the Lemuroidea, especially in Indris.

The capitellum is largest relatively in the Lemuroidea, where it often (as in Indris and the Nycticebinæ) occupies half, or more than half, of the articular surface of the distal end of the humerus (Plate XII. fig. 6). It is next largest in the Cebidæ, smaller in the Simiidæ other than the Simiinæ, still smaller relatively in Hylobates and Simia, then in Man and the Chimpanzee, and relatively smallest of all in the Gorilla. Sometimes in Cynocephalus, as also in Mycetes, Lagothrix, Indris, Nycticebus, and Perodicticus, the smooth surface is prolonged outwards externally to the convexity of the capitellum.

The projection of the radial margin of the trochlea is most prominent in Hylobates, the Chimpanzee, Man, the Gorilla, Indris, Lemur, and Hapale. It all but or quite disappears in the Cynopithecinæ (Plate XII. fig. 4), many Cebidæ (especially Ateles and Lagothrix), Loris, Nycticebus, and Arctocebus.

The innermost margin of the trochlea projects downwards below its radial margin in Man, the Chimpanzee, Simia, and the Cynopithecinæ, and *very* much so in the Cynocephali (Plate XII. fig. 4). It projects below the radial margin, but very slightly (or not at all) below the capitellum in the Semnopithecinæ, Cebidæ, and some Lemuroidea, *e. g.* Galago and the Nycticebinæ.

* In the Tamarin, according to De Blainville, *l. c.* p. 22, he adds, "ce qui n'a pas lieu cependant ni chez le Pinche ni chez les Ouistitis."

† In the specimens of T. Niger, Nos. 5177 c and 5177 d in the College of Surgeons, this perforation exists.

It scarcely projects below the radial margin, and *à fortiori* not below the capitellum in the Gorilla, Hylobates, Hapale, Indris (Plate XII. fig. 6), and Lemur.

Radius and Ulna.

Both these bones are always distinct and separate in the Primates, and being approximated at their extremities, diverge more or less from each other midway, the divergence being relatively most extreme in the Gorilla and Indris (Plate XII. fig. 7).

Radius.

The radius is absolutely longest in the Gorilla and Orang, but in the Chimpanzee and Siamang it is also longer absolutely than in Man.

Its length, as compared with that of the spine, is greatest in Hylobates, being more than four-fifths of the length of the latter. It is more than three-fifths in the Orang and Ateles, half, or a little more, in Troglodytes and Tarsius. In the great bulk of the order it is between three-tenths and two-fifths (Man being about as 35 to 100) of the length of the spine. It is a little less in the Nyctipithecinæ, and only a quarter of its length in Hapale and Lemur.

The total length of the radius rather more frequently falls short of than exceeds that of the humerus. It exceeds it most in Tarsius and the Indrisinæ. It also exceeds it, though not to such an extent, in Hylobates*, Loris, Perodicticus, Arctocebus, and, sometimes, at least, in Ateles†, Cynocephalus, Semnopithecus, and Simia. In all the others it is more or less shorter than the extreme length of the humerus, though in none so much so as in Man‡.

The radius is thickest relatively in Cynocephalus, and then in Man. It is very slender in Ateles and Loris, but most so in Hylobates.

The radius is always more or less curved, most so perhaps in the Gorilla and Indris. It expands laterally at its distal end, but this expansion is least marked in Hylobates, Ateles, and the Nycticebinæ. It is perhaps as marked in Man as in any other primate.

The ulnar margin is sometimes sharp as in Man, the lowest Simiidæ and others; sometimes it is rounded, as in Troglodytes, Hylobates, some Cebidæ, Indris (Pl. XII. fig. 6), and Loris.

The outer margin is rather marked in Man, less so in Troglodytes and Simia, and

* De Blainville says, "L'avant-bras est encore plus long que le bras d'un septième au moins" (*loc. cit.* p. 26).

† Dr. Lucae, *loc. cit.* p. 286 (Table of Measurements and Proportions), makes the humerus longer than the fore-arm in all the American apes, but in no others, and both equal in Colobus; yet at p. 287 he says that the humerus is the smaller in all the long-tailed apes, except Colobus and Ateles.

‡ In Brachyurus (British Museum specimen) I have found the radius to be to the humerus as 75·9 to 100, and in the Boschisman as much as 81 to 100, so that in some exceptional cases the human proportion is surpassed.

more rounded still in the other forms, except the Cynopithecinæ, where sometimes it is better defined than in Man, as sometimes also in Cebus, Lemur, and Galago.

The degree of distinctness of the ridges and depressions for muscular attachment is subject to much individual variation.

In the Cynopithecinæ, Ateles, and sometimes in Lemur and Nycticebus, there is a marked depression for the *supinator brevis*. I have not observed it elsewhere.

The ridge giving origin to the *flexor sublimis digitorum* is marked in Man and the lower Simiidæ (especially Cynocephalus). I have also found it marked in Chrysothrix, Indris, and Arctocebus; less, or not at all so in other forms.

The excavation in which the *flexor longus pollicis* takes origin is marked in Man, sometimes in Hylobates, in the Simiidæ other than the Simiinæ, in Cebus, Pithecia, Lemur, Nycticebus, and Arctocebus. In others I have found the surface flat or rounded. A similar depression for the *extensor pollicis* is sometimes very marked in the lower Simiidæ; it is also marked in Man (sometimes) and in Chrysothrix, and slightly so in Indris. In the other genera I have only observed a flattening of the bone at the most.

The insertion of the *pronator teres* is sometimes marked by a roughness of the surface. This I have seen in Man, the Orang, Cynocephalus, Mycetes, Chrysothrix, Hapale, and Nycticebus. A decided fossa is occasionally present at that spot as, sometimes at least, in Macacus, Callithrix, Brachyurus, Lemur, Galago, Perodicticus, Arctocebus, Tarsius, and Cheiromys.

The inferior margin of the anterior, or flexor, surface is now and then much produced, as in Man and Cynocephalus; sometimes only the ulnar side of the inferior margin is prominent, as in Ateles, Mycetes, Lemur.

In the Nycticebinæ there is a process, at the lower end of the radius, projecting ulnad and articulating with the head of the ulna. A rudiment of this process exists in Indris.

The lower end of the posterior surface is generally traversed by a median longitudinal ridge, which appears to attain its maximum in Cynocephalus.

The styloid process is constant. It is large in Man and the Simiinæ, shorter in the Cynopithecinæ, Cebidæ, and Hapale, very short in Indris, Lemur, and Galago, but longer again in Nycticebus and Arctocebus.

A prominence for the insertion of the *supinator longus* is more or less marked in Troglodytes*, Simia, and Hylobates. It is much so in some of the Cynopithecinæ, and in Cebus, Lemur, and Galago.

The foramen for the medullary artery is situated above the middle of the bone, and is always directed upwards, except in Ateles† and Arctocebus. In Ateles the long groove which the artery makes on the surface of the bone is remarkable.

The groove for the tendon of the *extensor ossis metacarpi pollicis* is almost always very marked. In Hylobates it equals in size that for the tendons of the radial extensors,

* Owen, Trans. Zool. Soc. vol. v. p. 7.

† Not always downwards in Ateles, however; for in a skeleton of A. Geoffroyii in the British Museum it is directed upwards in one arm and downwards in the other.

and it is very marked in Ateles, in spite of the rudimentary condition of the pollex. On the other hand, it is not distinctly marked in Indris, and it is small in the Nycticebinæ.

The groove for the radial extensors I have found to be sometimes double in Macacus, Ateles, and some Nycticebinæ.

That for the *extensor secundi internodii pollicis* I have only found distinct in Man, the Chimpanzee, and Orang.

The groove for the *extensor communis digitorum* is smaller relatively in the lower Simiidæ than in Man and the Simiinæ. It is small also in Ateles and Mycetes (thus differing from Hylobates), and generally in the Lemuroidea.

Ulna.

In absolute and relative length this bone varies almost as does the radius, being, however, always somewhat longer.

It is thickest (in the shaft), in proportion to its length, in Cynocephalus, most slender in Hylobates and Indris.

The bone is much curved in the Chimpanzee, less so in the Gorilla, Orang, and still less so in Man. It is generally more curved than in Man in the Cebinæ*, but straighter than in him in the other Cebidæ. It is sometimes very straight in Hylobates and the lower Simiidæ; also in Loris and Tarsius, but in the other Lemuroidea it is much as in Man.

The greater sigmoid cavity is exceptionally broad, in proportion to its length, in Man, Troglodytes, and Simia; in the other forms it is narrower, and turned more outwards, towards the radius.

The lesser sigmoid cavity looks outwards in Man, Troglodytes, Simia, and the Nycticebinæ. It looks more forwards in the lower Simiidæ.

The coronoid process (and surface for the insertion of the *brachialis anticus*) is at its maximum of breadth in Man. In Troglodytes and Simia this part is already narrower than in him, and more excavated. In the Hylobates it is still narrower, and yet more so in the lower Simiidæ, the Cebidæ, Hapale, and the Lemuroidea, especially in some of the Nycticebinæ.

The olecranon is broadest in Man, Simia, and Troglodytes. In Hylobates it is still very like that of Man; but in the lower Simiidæ it is much longer, extending further up (*i. e.* in the direction of the bone's length) beyond the sigmoid cavity, being at its maximum of development in this respect in Cynocephalus. The Cebidæ, including Ateles, resemble in this the lower Simiidæ, and the olecranon is very long in Mycetes. It is also long in Lemur and Galago, Tarsius, and Cheiromys, but is less so in Indris (Plate XII. fig. 7) and the Nycticebinæ.

There is a distinction between the anterior and inner surfaces of this bone in Man, Troglodytes, and Simia; but thence, downwards through the order, there may be said to be but one surface answering to these two of Man and the highest Apes.

* Its curved condition in Cebus is noticed by De Blainville, *loc. cit.* p. 8.

The anterior surface is generally not so depressed for the origin of the *flexor profundus* as in Man and Simia. The surface answering to the anterior and inner ones of Man is concave in Ateles and some other Cebidæ, and very much so in Lemur.

There is a deep depression for this last-mentioned muscle (inside the olecranon, or beneath the greater sigmoid cavity) in the Gorilla and Orang, the Simiidæ other than the Simiinæ, the Cebidæ (except Ateles), and the Lemuroidea.

In Loris and Indris there are no excavations or marked depressions for muscular attachment on the shaft of the bone, which is very rounded and cylindrical (Pl. XII. fig. 7).

The fossa for the origin of the *extensores pollicis* is marked in Man, and much so below the surface which gives attachment to the *anconeus*; as also in Simia and Hylobates. In Troglodytes it is much less so, and still less in the lower Simiidæ, except at the proximal end of the radial surface of the ulna. It is very slightly marked in Ateles and Mycetes, but more so in Lagothrix and Cebus; but slightly in the other Cebidæ, except Chrysothrix, in which, as also in Hapale, it is very marked. It is very marked in Lemur and Galago, less so in the other Lemuroidea.

The surface of the *supinator brevis* is marked and deep in Man and Troglodytes, less so in Simia and Hylobates. It is longer, but narrower relatively, in the Simiidæ other than the Simiinæ. In the Lemuridæ* it is absent.

The place of attachment of the *anconeus* is more marked in Man and Simia than in Troglodytes. In Hylobates, for the first time in descending from Man, it does not extend so high up as the upper margin of the lesser sigmoid cavity; and in the other lower forms of the order I have not found any fossa marked off from that for the *extensores pollicis*.

The ridge for the attachment of the *pronator quadratus* is very slightly marked indeed in Man, and very little more so in Troglodytes and the lower Simiidæ; while in the lower Cebidæ, Indris, Galago, and most Nycticebinæ it is rudimentary or absent. On the other hand, it is sometimes marked in Simia, and occasionally still more so in Hylobates, the Cebinæ, Mycetes, and Hapale, and also more or less in Cheiromys, but it attains its maximum of development in Lemur.

The head of the ulna is large and rounded in Man and Troglodytes. It is more transversely extended in Simia, and in all below is much smaller as compared with the styloid process, especially in Ateles, Hapale, Lemur, and Galago. It is rather larger again in Indris and the Nycticebinæ.

The styloid process is of moderate length in Man; it is shorter in the Gorilla, and still more so in the Orang. In the Chimpanzee it is longer and more curved; also in Hylobates, where it developes a peculiar prominence from its hinder side (for the internal lateral ligament of the wrist), which prominence also sometimes exists in the Cynopithecinæ and in Indris. The styloid process is very elongated in the Cebidæ generally; but in Ateles it becomes enormous, having a rounded articular head placed, as it were, at the end of a peduncle, and being really much more the continuation of the shaft of

* This muscle has no connexion with the ulna in Lemur.

the ulna than is the comparatively rudimentary head of the bone. In Lemur it is formed on the same type. In Hapale and Indris it is long, but in the Nycticebinæ it is very so, and curved, except in Perodicticus, in which it is exceedingly long but nearly straight, attaining perhaps the maximum of relative length in the whole Order *.

The foramen for the medullary vessels is always situated more or less above the middle of the bone, and is, as far as I have observed, always directed upwards.

Manus.

This segment attains its greatest bulk in the Gorilla; its absolute length, however, is greatest in the Orang, then in the Gorilla and Chimpanzee, and afterwards in Man. In Ateles and Indris it is longer than in any of the lower Simiidæ, except the Cynocephali.

The proportion borne by the whole length of the manus to that of the spine is greatest in Tarsius, Cheiromys, and Hylobates, where it is more than half, and then in Simia, where it is but little less. In the rest it varies between this and one-fourth, except in Cercopithecus, the Nycticebinæ, Lemur, and Chrysothrix; being shortest in Arctocebus, where it is rather less than one-fifth.

The length of the manus, as compared with that of the rest of the pectoral limb, is far greatest in Cheiromys, where the first is more than four-fifths of the latter; then in Indris, Nyctipithecus, Galago, and Tarsius, where the proportion is as much as, or more than, 45 to 100; in the rest it varies between this and three-tenths, except in Loris, where it is scarcely more than one-quarter.

The length of the manus, as compared with that of the radius, is far greatest in Cheiromys, where the former is much more than once and a half the length of the latter. In Tarsius the manus is considerably longer than the radius, and in Brachyurus and Hapale the two segments are about equal. The manus is always more than half the length of the radius, except in Loris, where it is a little less†. In Man it appears to be generally a little more than three-fourths of its length.

Carpus.

The largest carpus is that of the Gorilla; that of the Orang about equals Man's, while the Chimpanzee's is slightly smaller.

This segment, excluding sesamoids, consists of eight or nine bones, except where an extra ossicle exists in the transverse carpal ligament‡.

Its length (measured from the summit of the semilunare to the distal end of the

* See Van Campen's representation, plate 1, fig. 3, in the Verhandelingen der Koninklijke Akademie van Wetenschappen. Zevende Deel, 1859.

† As mentioned by De Blainville, *loc. cit.* Lemur, p. 17.

‡ Only the case, as far as I have been able to ascertain, in Perodicticus (see Plate XIV. fig. 5). It is described and figured by Van Campen in his Memoir on the Potto of Bosman in the Verhandelingen der Koninklijke Akademie van Wetenschappen. Zevende Deel, 1859, p. 18, and plate 1, figs. 4, 10.

magnum), as compared with that of the spine, appears to be greatest in Cheiromys, the Orang, and Hylobates, and least in Loris and Indris.

Its length, as compared with that of the entire manus*, I have found to present no important differences, but it generally appears not to more than very slightly exceed one-fifth, and in the long-handed forms (Ateles, Hylobates, and the Chimpanzee) it is but little more than one-tenth.

The breadth of the carpus almost always exceeds its length, being often, as in Man, half as broad again as long. In Hylobates, however, the length equals or slightly exceeds the breadth; as also in Perodicticus and Arctocebus, while in many genera there is little difference between the two dimensions.

The carpal bones, at their proximal end, always form a double arch, as in Man. The arch which has its convexity turned towards the fore-arm, is in general rather more acute than in him† or than in the Gorilla. This is especially the case in the Nycticebinæ; but in most of the other forms its outline is generally more or less interrupted by the projection of the pisiforme.

The arch which has its concavity towards the palm, is sometimes not much marked, as, *e. g.*, in Ateles; but generally it is more so than in Man, and in the Nycticebinæ it becomes remarkably deep, and, finally, in Perodicticus is changed, by the introduction of a supernumerary ossicle into a complete ring of bone (Plate XIV. fig. 5).

Rarely, *i. e.* only in Man, Troglodytes, and Simia, the carpus articulates directly with the radius alone; in all other forms it does so with the ulna as well as with the radius —to a very slight extent, however, in the Nycticebinæ.

Scaphoides.—This bone has always much the same shape throughout the Order. On its radial side is a tuberosity which sometimes, as in some of the lower Simiidæ, the Gorilla‡, Indris, and the Nycticebinæ, is much enlarged. It is generally received into a concavity formed by the trapezium and a sesamoid.

In Man, Troglodytes, and the Indrisinæ the connexions of the scaphoid are as in Man; but in all other forms an os intermedium separates it from the bones of the distal row, except the trapezium. In Man and Troglodytes there is a transverse dorsal groove.

Intermedium.—This bone, which in most cases might from its shape be termed a

* Sometimes, however, there appears to be considerable variation as to this proportion, as Lucae gives the proportions of the carpus to the manus at 100, as follows:—Inuus, 10·5; Macacus gelada, 20; Semnopithecus entellus, 12·03; S. comatus, 9·4!

† Dr. Lucae in a note (*loc. cit.* p. 289) criticizes Professor Huxley's remark "The bones of the first row with the bones of the fore arm form the wrist-joint, and are arranged side by side, no one greatly exceeding or overlapping the rest" (Man's Place in Nature, p. 87), saying that such a condition of the parts would limit the motion of the wrist to flexion and extension. It is surely obvious that several conjoined bones, no *one* of which "greatly exceeds or overlaps the rest," may together produce a very considerable convexity. Professor Lucae writes as if Professor Huxley had asserted that the proximal surfaces of the proximal carpals were all in one plane, instead of stating the undoubted fact that the projection of any *one* is small.

‡ Owen, Trans. Zool. Soc. vol. v. plate 10, fig. 1, and pp. 9 & 10.

second semilunare *, exists in all the genera of the Order below Troglodytes, with the exception of those forming the subfamily Indrisinæ †.

It has a flattened proximal surface, which joins the ulnar part of the concave distal articular surface of the scaphoides.

Its distal surface is generally deeply concave antero-posteriorly, and embraces the radial side of the head of the magnum, and sometimes (as in the Nycticebinæ and Cheiromys) the unciforme also, which last, however, is excluded from it in the Anthropoidea, and apparently also in Tarsius ‡.

At the ulnar side of the bone is a narrow surface, which articulates with the radial side of the semilunare.

At the radial side of its distal surface is a concavo-convex surface, which joins the trapezoides, and on its palmar side is a narrow surface, which joins the radial side of the distal surface of the scaphoides.

This bone appears to answer to part of the scaphoid of Man, as De Blainville §, Professor G. M. Humphry ‖, Professor Huxley ¶, and others have regarded it, and not to be a dismemberment of the os magnum, as Cuvier ** seems to have been inclined to consider it. Indeed, if that part of the scaphoides of Man which is on the distal side of the dorsal groove were cut away, it would answer tolerably well to the intermedium. Nevertheless, the united scaphoides and intermedium of any ape together form a mass which is much more disto-proximally extended than is the ulnar part of the human scaphoides.

In one manus of a Chimpanzee ††, however (Plate XIV. fig. 1), I have found the scaphoides develope a large process, embracing the magnum dorsally, while at the same time the part passing beneath the trapezium is much developed, so that in this case it, I think, evidently and completely responds to both the scaphoides and the intermedium of the Orang (Plate XIV. fig. 2).

Again, in Indris, in which the intermedium is wanting, the outer part of the scaphoides is enlarged, and has a more or less marked projection over the dorsum of the os magnum ‡‡. It would be a fact of much interest if it should turn out that in the

* Its form in Cynocephalus is very well described by Dr. Johann Georg Ilg, 'Monographie der Sehnenrollen.' Zweiter Absehnitt. Erste Abtheilung, 1824, p. 4.

† I make no doubt but Propithecus resembles in this Indris and Microrhynchus.

‡ Burmeister's 'Tarsius,' Table 2, fig. 5, *b*; and Blanchard's 'Règne Animal,' Mammifères, Primates, pl. 22, fig. 9, *b*. In Cheiromys it joins the unciforme, and extends between it and the lunare.—Owen, Trans. Zool. Soc. vol. v. pl. 21, figs. 17 & 18, *i*.

§ *Loc. cit.* Pitheeus, p. 16.

‖ In his very interesting and valuable memoir on the limbs of Vertebrates. 1860, p. 4.

¶ Hunterian Lectures. See 'Medical Times,' 1864, vol. i. p. 565.

** Leçons d'Anat. Comp. 2nd edit. 1835, vol. i. p. 425.

†† The skeleton No. 5083A in the Museum of the Royal College of Surgeons. M. Gratiolet has, I find, noticed the same thing in his recent treatise, 'Troglodytes Aubreyi,' in the Nouvelles Archives du Muséum, vol. ii. 1866.

‡‡ De Blainville, *loc. cit.*, Lemur, pl. 10.

Chimpanzee or Indris the distal part of the scaphoid is developed from a separate centre of ossification.

If Fischer's observation be correct,—that the intermedium, which he found separate in the young Macaco, was in an adult one united with the scaphoides *,—these separate centres may not improbably exist in the young, at least, of Indris †.

Semilunare.—This bone has much the same shape throughout the Order. In the Gorilla, and also in other Simiidæ, it is larger and broader relatively than in Man. In some forms, where it is relatively small, as in Lemur and Indris ‡, it yet unites slightly with the unciforme, from which in higher forms it is, although relatively larger, sometimes excluded. It is large in the Nycticebinæ, projecting much proximally in Loris, as also in Tarsius §. It is very large in Cheiromys, where it is separated from the unciforme by the extension of the intermedium as far as the cuneiforme ‖.

Cuneiforme.—This is longer and narrower in Troglodytes than in Man, and it is exceedingly elongated in Simia. It is large also in the lower Simiidæ. Compared to the semilunare, it is large in Lemur, and still more so in Indris ¶, but in Loris it is much smaller than the last-mentioned bone.

In all but Man, Troglodytes, and Simia, it articulates directly with the ulna, though very slightly so in the Nycticebinæ. In all the rest of the Order it has an articular surface, for the reception of the styloid process of the ulna, which is contiguous to a similarly destined articular surface of the pisiforme.

Sometimes in the lower Simiidæ the outer end of the cuneiforme is produced into a rounded process or tubercle, projecting into the palm in front of the pisiforme.

The cuneiforme is small in Tarsius **.

Pisiforme.—The pisiforme is very small, relatively, in Man, Simia, and the Nycticebinæ. It is rather small in the other Lemuroidea and in Ateles; larger in the rest of the Cebidæ (especially in Mycetes, where its distal end is much expanded) and in Hapale; larger still in the Simiidæ other than Simia, and very large indeed in the Gorilla, where it attains its greatest absolute size, though relatively, perhaps, it is yet greater sometimes in Cynocephalus. In Hylobates it is long, but slender.

The pisiforme of the Simiidæ resembles that of Man, enlarged and pulled out at its free end, so as to change the little transverse groove which exists in him into a very long and slightly concave surface.

In all, except Man, Simia, and the Nycticebinæ, it developes an articular surface for the ulnar side of the styloid process of the ulna, and contributes to form, with the

* His words are, "Dieses wäre später gewiss mit dem Kahnhein ganz verwachsen."—Anatomie der Maki, p. 142. And the intermedium is represented as united with the scaphoides in his plate, Tab. 15. fig. A, 7.

† In January 1867 (therefore since this paper was communicated), Dr. Wengel Gruber published an account of a divided human scaphoides. See Reichert and Du Bois Reymond's Archiv, 1866, p. 565, Tab. 16.

‡ Its smallness in these genera is noticed by De Blainville, *loc. cit.* pp. 10 & 21.

§ Burmeister's 'Tarsius,' Tab. 2. fig. 5, *c*.

‖ Owen, *loc. cit.* pl. 21. fig. 18, *l*, *i*, *u*.

¶ De Blainville, *loc. cit.* Lemur, pl. 10.

** Burmeister, *loc. cit.* Tab. 2. fig. 5, *d*.

cuneiforme, a cup for the reception of the end of that process. This cup may be well seen in the lower Simiidæ, the Cebidæ, and Lemur.

In the Nycticebinæ this bone is very small (as has been already remarked), and bending distad, is applied to the outer surface of the unciforme, and has its extremity united to the palmar process of that bone.

Trapezium.—This is often a very irregularly-shaped bone. It is most nearly quadrate in the lower Simiidæ and Cebidæ; it is most compressed disto-proximally in Man, Troglodytes, and the Lemuroids, but especially in Indris and the Nycticebinæ (Plate XIV. fig. 4).

The radial tuberosity varies as to its development. It is sometimes enormous in the Gorilla * and large in the Chimpanzee, but in Man, Simia, the Simiidæ below the Simiinæ, and in the American Anthropoidea it is slight. In Lemur this process projects ulnad, and in Arctocebus it is large, and approaches within a short distance of the unciforme, to which it is united by a strong ligament. In Indris this process is conspicuous, and rather acute; it is bent distally and rather ulnad. In Hylobates it is sometimes developed to an extent rivalling that of the unciform process, being very long and projecting distad and ulnad. In Perodicticus it is very much developed, and is somewhat like that of Hylobates, only that its width from disto-proximally is less compared to its transverse extent, and that it is directed more transversely and less distally than in Hylobates. It approximates to the unciform process, but is separated from it by an extra ossicle (Plate XIV. fig. 5).

Very commonly a sesamoid exists (from Simia † downwards) at the radial border of the trapezium, and helps to complete the concavity for the reception of the radial end of the scaphoid. This sesamoid cannot be, as Dr. Lucae suspects ‡, a separated tuberosity, because it exists separately (*e. g.* Hylobates, Perodicticus) when that process is at its maximum, and in Loris and Nycticebus it is present, together with two processes (Plate XIV. fig. 4).

The surface for the reception of the first metacarpal is convex from the dorsal to the palmar surface of the bone, and sometimes it is more or less concave in the reverse direction, *i. e.* radiad from the trapezoides. In Man alone is this concavity constantly and strongly developed.

In the highest Apes there appears to be much irregularity as to its development. Thus in the Gorilla it is sometimes very well marked, sometimes § very slightly. In the Chimpanzee it is generally developed slightly, but sometimes absolutely

* Owen, Trans. Zool. Soc. vol. v. pl. 10, figs. 1 & 2.

† Dr. Lucae speaks of it in the Orang, and represents it (*loc. cit.* pp. 304 & 305, and pl. 3. fig. 8). It is figured by Professor Vrolik in Todd's Cyclopædia of Anat. and Phys. vol. iv. p. 204, fig. 124, *i*. Mr. W. H. Flower also informs me that he observed its existence in the wrist of an adult male Orang at the Museum of Leyden.

‡ *Loc. cit.* p. 305.

§ *E.g.* No. 5179 A in the Osteological Collection of the College of Surgeons.

disappears * (Plate XIV. fig. 3). In Simia it is sometimes as marked as in the Gorilla; sometimes, however, it can hardly be said to exist at all.

In Hylobates there is no trace of any concavity, but a strongly convex and rounded tubercle receives the concave articular surface of the base of the metacarpal of the pollex †.

In the lower Simiidæ the concavity is again sometimes present, though it is always very slight, and occasionally in Semnopithecus there is no indication of it, though in Colobus I have found it decidedly present, but slight; in Dr. Lucae's specimen, however, it was absent ‡.

In Ateles the trapezium is large in spite of the rudimentary condition of the pollex; but there is no saddle, *i. e.* no concavity for the metacarpal §.

In the other Cebidæ the depression sometimes exists. I have observed a decided, though small saddle in Brachyurus and some specimens of Cebus; in others I could detect no trace of such a structure, nor have I found such in the other genera of Cebidæ I have been able to examine.

In the Lemuroidea the concavity is very slight, though it may generally be detected.

The trapezium is always so placed that the axis of the convexity of the saddle forms a marked angle with a line drawn across the articulations of the four outer metacarpal bones with the proximal row of carpals ‖ (Plate XIV. figs. 6 & 7).

In Man and the Gorilla this angle is very open, but in the Chimpanzee and sometimes in lower Simiidæ it is smaller, the trapezium being, as it were, somewhat more pressed inwards, at its radial end, towards the middle of the palm. It is never, however, so inclined inwards as is the axis of the cylinder of the entocuneiforme of the pes, though the resemblance is considerable in the Chimpanzee, which thus differs from the inferior forms, as well as from Man.

In the American Anthropoidea the trapezium is well set out; and this, no doubt, contributes to produce that very feeble opposition and palmad flexion of the pollex which have been noticed to exist in them.

Trapezoides.—This bone is generally pyramidal in shape, the apex being towards the palm. It is more pointed at its palmar end in the lower Simiidæ than in Man, and still more so in Lemur.

It is very small in Tarsius ¶, but of ordinary relative size in Arctocebus and Perodicticus, in spite of the rudimentary condition of the index.

* *E. g.* the mounted manus, No. 744, in the same collection. The absence of a saddle in this species is noticed by Professor Huxley: see 'Medical Times,' 1864, vol. i. p. 428.

† Noticed by Dr. Lucae, *loc. cit.* p. 305, and Tab. 4. fig. 8.

‡ *Loc. cit.* p. 311.

§ Dr. Lucae speaks of the convex articular surface which, in Ateles, is received into the concavity of the metacarpal (*loc. cit.* p. 311).

‖ The "digital angulation" of Professor Huxley. See 'Medical Times,' vol. i. p. 177.

¶ Burmeister, *loc. cit.* Tab. 2. fig. 5, *g*.

In Man and the Simiidæ the proximal angle of its radial side is produced,—not so in other forms.

In all but Man, Troglodytes and the Indrisinæ, it articulates with the intermedium.

Magnum.—This bone is not generally the largest of the carpals *. As seen in a carpus with the bones articulated together, it appears much less than the unciforme in Hylobates, as also generally in the lower Anthropoidea, and always in the Lemuroidea.

It has throughout much the same shape as in Man; but its distal articular surface is often more concave, as are also its lateral margins.

It projects distally beyond the trapezoides in Man, the Simiidæ (though *very* slightly so in Hylobates), the Cebidæ (except Ateles and Lagothrix), Hapale, Lemur, the Nycticebinæ, Tarsius, and Cheiromys.

It may or may not articulate with the fourth metacarpal. Thus in the lower Simiidæ there is a distinct articular surface for the latter, but not in Lemur.

Unciforme.—In all the Primates this bone has a shape very similar to that which it presents in Man, but, as has been already remarked, it often predominates in size over other carpals.

The palmar process is enormously long in Hylobates, and I have found it † very large in the Nycticebinæ, large also in Indris, the Simiinæ (especially Simia), and Man. In him and in the Nycticebinæ this process projects much palmad, in other forms less palmad and more distad. In some, as in Macacus and Lemur (at least sometimes), it is so small as to form merely, as it were, the palmar lip of the distal articular concavity.

As has been said, an extra bone exists in Perodicticus, namely, an ossification of the anterior ligament of the carpus between the processes of the trapezium and unciforme. This small bone, which has been described and figured by Van Campen ‡, is subtriangular in shape, and joining, as it does, the unciform process on one side, and the tuberosity of the trapezium on the other, it causes the flexor tendons to pass through a complete bony ring (Plate XIV. fig. 5).

Metacarpus.

The greatest absolute length of this segment is exhibited by the third metacarpal of Simia.

The length of this part of the skeleton, as estimated by a comparison of the third metacarpal with that of the whole manus, is greatest in Simia and Troglodytes, where the length of the former is almost two-fifths of that of the latter. In the rest of the Order it varies between this dimension and that of Brachyurus and Loris, in which genera it is very little more than a quarter, except in Arctocebus, where it is even somewhat less.

* Speaking of Cercopithecus sabæus, De Blainville remarks that the unciforme is larger than the magnum (*l. c.* p. 16).

† Yet De Blainville found it little marked (*loc. cit.* Lemur, p. 15).

‡ In the periodical before referred to.

The metacarpus always much exceeds the carpus in length. It does so most, perhaps, in the Chimpanzee and Indris, and probably least in the Nycticebinæ.

The proportion of this segment to the spine is greatest in Hylobates, where it is sometimes nearly one-fifth, and then in Tarsius, the Chimpanzee, Cheiromys, and Ateles. It appears to be least in the Nycticebinæ.

The four outer Metacarpals.—These metacarpals are always more or less enlarged at each end. The proximal ends are never much wider transversely than the distal ones, and very rarely so at all. It is the case, however, in the Nycticebinæ, and at least sometimes in Lemur, and slightly in Cynocephalus. On the other hand, the distal ends often greatly exceed the proximal ends in breadth, as is the case in the Simiinæ and Ateles.

The proximal articular surfaces are more or less concave in Man and Troglodytes. In Simia and Hylobates those of the fourth and fifth metacarpals become decidedly convex, and in the lower Anthropoidea that of the third becomes convex also, and all four become so in the Lemuroidea.

The proximal surfaces of these metacarpals are in most Primates nearly at right angles with the long axes of their shafts; but in Hylobates a line joining these surfaces inclines distally as it proceeds ulnad from the index, and this inclination exists slightly in Troglodytes, sometimes in Lemur, and a trace of it is to be seen in Man.

The antero-posterior diameters of the heads (*i. e.* from dorsum to palm) are never greatly in excess of the transverse ones, except in Indris, Lagothrix, and Ateles, though slightly so in Simia and Hylobates. Generally the two diameters are about equal.

The shafts always broaden downwards (*i. e.* distad) decidedly. They are always flatter on the dorsum than are the metatarsals, and never so laterally compressed.

Antero-posterior planes extending vertically through the metacarpals from the dorsal, to the most prominent parts of the palmar surfaces, have their palmar edges in the fourth and fifth metacarpals, inclined towards the middle of the palm. Often the same can be said of such a plane traversing metacarpal of the index.

The shaft of the fifth metacarpal is never much flattened on its palmar surface.

The palmar surfaces of the metacarpals are more concave disto-proximally than those of the metatarsals in the same individual, yet scarcely so, perhaps, in Simia and Hylobates.

The metacarpals always diverge more or less distally; least so, perhaps, in Hylobates, Simia, and the Nycticebinæ, though (except in the last-mentioned subfamily) always more so than do their homotypes of the pes.

The heads are never bent ulnad at their extremities, but continue pretty much in the same direction as the shafts.

The distal articular surfaces are in all formed nearly as in Man, but are shortest dorsally in him.

In Man and the Simiinæ they are much larger than the homotypal parts of the pes. In the lower forms they are but slightly so.

First Metacarpal.—This metacarpal attains its greatest absolute length in the Orang. As compared with the spine, it is longest in Tarsius, where it is more than one-tenth of

the length of the latter—which it is also, sometimes, in Hylobates. It has always more than half that proportion (*i. e.* than one-twentieth), except in Chrysothrix, Loris, Nyctipithecus, Arctocebus, Lemur, Perodicticus, and Colobus. In the last it is to the spine only as about 3·5 to 100.

There is never a very large process on the palmar side of its proximal end, as there is so often in the corresponding part of the hallux.

The proximal articular surface is sometimes concavo-convex, as in Man, the Gorilla, sometimes in the lower Simiidæ and Cebidæ, and in the Nycticebinæ. But there is individual variation in this respect; and often this double curvature is scarcely to be detected, *e. g.* in the Chimpanzee, Simia, Lemur, and Ateles. In Hylobates there is a concave surface only, which unites with the articular ball of the trapezium.

The shaft of the bone generally broadens distally, but sometimes (*e. g.* in some of the lower Simiidæ) it tapers, yet never so much so as does the shaft of the hallux of the same species.

The distal end is rarely broader than the proximal one, generally it is of almost the same width, but sometimes narrower. It is probably never so much broader in the forms below Man as it is in him.

The angle formed by the transverse axis of the head with another similarly traversing the heads of the other metacarpals, always more or less nearly approaches a right angle, except in the Cebidæ and Hapale, where it is more obtuse, yet not so much so as is the homotypal angle of the pes of Man.

This metacarpal is never the longest one of the manus in any species, and it is the shortest one in all except the Nycticebinæ (where it exceeds in length the second metacarpal, and sometimes the fifth also) and Tarsius, where it slightly exceeds the fifth, but not the second one *.

Second Metacarpal.—This is sometimes the absolutely shortest metacarpal found in the whole order; namely, in Arctocebus. It is the longest of all in the same manus in Man, sometimes in Troglodytes and Simia, in Hylobates, and in the Cynopithecinæ.

It is the shortest one in the Nycticebinæ. It is shorter than the three metacarpals external to it in Indris, Cheiromys, and, of course, in the Nycticebinæ.

Its proportion to the metacarpal of the pollex is greatest in the Chimpanzee, where it is more than twice and a half its length, then in the Semnopithecinæ and the Gorilla. In all the rest it is longer than the metacarpal of the pollex, except in the Nycticebinæ, where, in Arctocebus, it is scarcely more than three-fourths its length.

The metacarpal of the index projects furthest (distad) of any in the same manus, in Man, sometimes in Troglodytes, in Hylobates, and sometimes in the lower Simiidæ.

It projects distad less than do the three metacarpals external to it in some, *e. g.* in Ateles, Pithecia, and sometimes Hapale, the Lemuridæ, and Cheiromys.

In Indris the shaft is much curved, with the concavity radiad.

* See Burmeister and Blanchard, *loc. cit.*

The proximal end always articulates more or less with the trapezium and magnum.

The proximal articular surface is sometimes strongly concave transversely, as in most Anthropoidea; sometimes it has a very strong projecting ridge, as in Loris, or the surface may be even, as in Lemur. In Indris it sends a remarkable lateral process to the radial side of the magnum.

Third Metacarpal.—This metacarpal is the one which attains the greatest absolute length in the whole order, which it does in Simia. Its proportion in length to the whole manus is greatest in Simia, Troglodytes, and Cynocephalus, where it is nearly two-fifths the length of that segment. It is always more than one quarter, except in Arctocebus, where it is a little less. It is the longest metacarpal of all in the same manus in many; namely, sometimes in Troglodytes and Simia, in almost if not all Cebidæ (except Pithecia), in Hapale, and in all the Lemuroidea, except Indris (Indrisinæ ?), above all in Cheiromys *. It is never the shortest metacarpal of any manus. It projects most distad of any in the same manus in Simia, sometimes in the lower Simiidæ, in Lagothrix, Cebus, Nyctipithecus, Chrysothrix, Hapale, the Nycticebinæ, Tarsius, and Cheiromys.

There is an angular projection at the radial side of the proximal end of the dorsum, in Man, and to a much less extent in the Simiinæ. I have not observed this in lower forms.

The proximal articular surface is concavo-convex in Man and the Simiinæ. In lower forms it is generally more or less strongly and exclusively convex; rarely it is decidedly concave, as I have found it in Ateles.

Fourth Metacarpal.—This is the longest one of the manus in Pithecia and Indris, but it is never the shortest one.

It projects slightly the most distad of all in Ateles, Pithecia, Indris, Lemur, and Perodicticus. The proximal articular surface is generally strongly convex antero-posteriorly, as in the lower Simiidæ and Cebidæ. It is less convex in Lemur, very slightly so in Indris. In Man and Troglodytes it is concavo-convex, and more or less, though sometimes *very* slightly, so in the other Simiinæ and in Ateles.

Fifth Metacarpal.—This metacarpal is never the longest of all in the same manus, except sometimes (as rarely in the lower Simiidæ) when its backwardly projecting process is included in the measurement.

It is the shortest of all except the pollex in Man, the Simiidæ, most Cebidæ, Hapale, and sometimes in Lemur. It is shortest of all, including the pollex, in Tarsius.

It never projects more distad than the other metacarpals, but it does so least, excluding the pollex, in Man, the Simiidæ, Lagothrix, Cebus, and lower Cebidæ. It does so least of all (pollex included) in Tarsius.

The proximal articular surface is always more or less strongly convex.

A process sometimes extends backwards from its proximal end, outside the carpus, like that of the homotypal bone of the pes. This, however, is large only in the lower

* In Cheiromys alone is it almost double the length of the second metacarpal, and nearly one-third longer than the fourth, being at the same time very much more slender than any of the other metacarpals.

and lowest Simiidæ; but even there it is never so large as the corresponding process of the pes in the same individual.

Phalanges.

In almost all species the metacarpals all support phalanges, the only exceptions being in Colobus and Ateles *.

In all other genera the pollex has two phalanges, and the three outermost digits have always three each. The index has also always three phalanges, except in Perodicticus and Arctocebus, where there are only two.

The *proximal phalanx of the pollex* is absolutely longest in Man, the Chimpanzee, the Gorilla, and the Orang.

It is always shorter than the first metacarpal, except in Nyctipithecus, Perodicticus, and Cheiromys; in the last, indeed, it greatly exceeds it. There is very little difference, however, in Chrysothrix, Hapale, Lemur, Galago, Loris, and Arctocebus. On the other hand, in Colobus it is only one-third of the length of the metacarpal, and in Semnopithecus, Hylobates, and Simia there is also a great difference, though it is always more than half the length of the metacarpal.

The *second phalanx* is always shorter than the first; it is less even than half its length in Semnopithecus, sometimes in Macacus, in Nyctipithecus, Chrysothrix, Indris, Lemur, Galago, and Loris.

It is always flattened at its distal part from dorsum to palm, except in Hapale, in which genus it is laterally compressed, curved and pointed at the end.

The *phalanges of the other digits* are of very similar form throughout the order, and, as in Man, are convex transversely on the dorsum and flattened on the palmar side of each.

The ultimate phalanges are always flattened from dorsum to palm, except in Hapale, where they are laterally compressed, curved and pointed to support the similar-shaped claws of that genus. In Cheiromys they are much attenuated.

The *proximal phalanx of the third digit* is as long as, or longer than any other phalanx of the four outer digits in the Anthropoidea and Tarsius. That of the fourth digit is the longest in the Nycticebinæ and Cheiromys, but the predominance in length of the second phalanx of the fourth digit over the second phalanx of the third digit, which occurs in Cheiromys, is quite peculiar to that genus †.

The relative length of the phalanges may be estimated by selecting those of the third digit for comparison.

Thus the proximal phalanx is always much more than half the length of the third

* Dr. Lucae has found one phalanx in the pollex of Colobus, but none in that of Ateles. He concludes, however, from the form of the distal end of the metacarpal in the latter genus, that a phalanx has existed and been lost. Professor Huxley says that there is usually a small and nodular phalanx in Ateles (Medical Times, 1864, vol. i. p. 93).

† See Owen, Trans. Zool. Soc. vol. v. pl. 21. fig. 17.

metacarpal. It almost equals it in length in Lagothrix, Cebus, Pithecia, Chrysothrix, Lemur, Arctocebus, and sometimes in Hapale *. It slightly exceeds it in Brachyurus, Nyctipithecus, Galago, Loris, and Perodicticus, and very largely so in Tarsius and Cheiromys.

Its proportion to the manus is greatest in the two last-mentioned genera (about as 34 to 100), in all the rest it is more than a quarter, except in Ateles, Cynocephalus, Cercopithecus, Troglodytes, Man, and last of all, Arctocebus, where it is as 21·5 to 100.

It is at its greatest absolute length in Simia.

The *second phalanx* is at its greatest absolute length in Simia and the Chimpanzee.

It is always more than half the length of the proximal phalanx, except in Perodicticus and Cheiromys, where it is a little less. It is never, however, nearly so long as the first phalanx.

The *third phalanx* of the third digit is, like the other phalanges, absolutely longest in Simia.

It is always shorter than the second phalanx, and is less than half its length in the Chimpanzee, Orang, Hylobates, Semnopithecinæ, Macacus, Pithecia, Nyctipithecus, Chrysothrix, Indris, Lemur, Loris, and Cheiromys. In Tarsius alone is it less than one-third of the length of the second phalanx.

The phalanges always shorten successively, except that the second phalanx of the fourth digit is longer than the proximal phalanx of the index in Galago and the Nycticebinæ (especially, of course, Perodicticus and Arctocebus), and that it is longer than the proximal phalanx of the fifth digit also in Cheiromys.

Digits without their Metacarpals.

The *pollex* thus measured is absolutely longest in Man when of average size.

As compared with the whole length of the manus, it is greatest in Arctocebus (about as 35 to 100), then in Hapale, Chrysothrix, and Man. In all it is more than one-fifth the length of the manus, except in the Simiinæ and Semnopithecinæ, Nyctipithecus, and Galago. It is less than a twentieth in Colobus †.

The pollex is never the longest digit of the manus, but, except in Perodicticus and Arctocebus, it is always the shortest one.

The *index* is never the longest digit of the manus, but in the two last-mentioned genera it is the shortest one. It is decidedly the shortest, except the pollex in the Lemuridæ and Cheiromys. It projects furthest distad in none; it does so least of the

* According to Dr. Lucae, the first phalanx is equal to the metacarpal in length in Hapale and Galago (*loc. cit.* p. 320).

† Dr. Lucae, *loc. cit.* p. 318, says that the pollex without its metacarpal does not by a good deal attain in the tailed Apes the proportionate length which it reaches in the Simiinæ. I have found all the lower Simiidæ to exceed all the Simiinæ in this respect except T. niger, and Dr. Lucae, in his Table B., gives for the proportion to the manus at 100, 22 & 24 to Cynocephalus, while to H. Leuciscus (which has the highest proportion of his Simiinæ) he only assigns 21·7 (see pp. 307 & 317).

four outer digits in all the Lemuroidea, except Tarsius. In Arctocebus and Perodicticus the index is extraordinarily short, consists only of two phalanges, and is absolutely and relatively the shortest digit of both manus and pes. It is also as short as, or shorter than the metacarpal which supports it, which in all other forms it exceeds in length.

As compared with the whole manus, the index is longest in Chrysothrix, Tarsius, Lagothrix, Mycetes, Lemur, and sometimes Hylobates, where it exceeds half the length of the former. Excluding the Nycticebinæ, it only falls below two-fifths in some of the lower Simiidæ.

The *third digit* is absolutely longest in Simia; as compared with the length of the whole manus, it is longest in Tarsius and Chrysothrix, where it exceeds three-fifths the length of that segment, and then in Lagothrix and Mycetes.

It exceeds two-fifths in all, but very slightly so in Arctocebus, in which it is shortest.

It is the longest digit of the manus in Man and the Simiidæ, Nyctipithecus, Chrysothrix, and Tarsius. In the Cebinæ the fourth equals it.

It is never the shortest nor ever the one which projects least distad. It projects furthest distad of the digits of the manus in the Anthropoidea, except Pithecia, and in Tarsius.

The *fourth digit* is the longest one of the manus, and also projects furthest distad in Pithecia, and in all the Lemuroidea except Tarsius.

It about equals the third digit in length in many of the Cebidæ and in Hapale.

It is never the shortest, even excluding the pollex. The fourth digit projects further distad than does the index, in Troglodytes, Simia, the Cebinæ, and Lemuroidea. The projection of the two is about equal in Hylobates and the lower Simiidæ.

The fourth digit is almost always somewhat longer than the second.

The *fifth digit* is never the longest or most distally projecting one of the manus.

It is the shortest one, except the pollex, in Man and the Simiidæ, and it is about equal to the index in the Cebidæ and Tarsius. It projects least of the four outer digits in the Anthropoidea and in Tarsius.

The proportion borne by the longest digit, without its metacarpal, to the longest metacarpal, is greatest in Cheiromys and Tarsius, where the first is more than twice and a half the length of the second. Then in the Nycticebinæ, where it is considerably more than twice as long. In the rest it varies between this proportion and once and a quarter, except sometimes in Cynocephalus, where the longest digit may scarcely exceed the longest metacarpal by more than one-fifth of the length of the latter.

Digits with their Metacarpals.

Thus estimated the *pollex* is absolutely longest in Man, when of average size, and then in the Orang and Gorilla.

Its proportion to the spine is greatest in Tarsius, namely more than one-quarter; then in Cheiromys, and sometimes in Hylobates, where it equals one-fifth. In the rest

it varies between this and a tenth, except in Cercopithecus, Semnopithecus, Ateles, and Colobus, being in the last genus less than one-twentieth.

Its length, compared with that of the entire manus, is greatest in Arctocebus, and then in Chrysothrix, in both of which it considerably exceeds one-half. It does so slightly in Man, Hapale, and also in Loris. In the rest it varies between this proportion and two-fifths, except in the Simiinæ *, Cheiromys, and Semnopithecus, and finally, in Colobus and Ateles, in which two last genera it is less than one-fifth.

The pollex, when extended beside the index, exceeds it greatly in Arctocebus and Perodicticus †. It reaches nearly to the distal end of the second phalanx in Loris, and to the distal end (or very near it) of the proximal phalanx in the Cebidæ, and mostly in Hapale. It reaches considerably beyond the middle of that phalanx in Man, Tarsius, and Cheiromys, beyond the middle in Indris, and to its middle in Lemur and Galago. Occasionally in the lowest Simiidæ it nearly reaches the middle of the proximal phalanx, but generally does not extend so far. It goes but very little beyond the proximal end of that phalanx in the Gorilla and Hylobates, and still less beyond it in Semnopithecus. In the Chimpanzee it barely attains the distal end of the metacarpal of the index, while in Simia it decidedly falls short of its end. In Ateles, *i. e.* in the specimens examined (without a phalanx), it reaches more than halfway down the metacarpal of the index, but in Colobus (with a phalanx) it does not attain its middle.

The pollex, when compared with the longest digit of the manus, is at its maximum of relative length in Cheiromys (in spite of the great length of its longest digit), being almost quite three-fourths the length of that digit. Arctocebus and Hapale, Loris, and Man follow, its proportion in all four being more than three-fifths. The rest vary between this and Hylobates (where it is sometimes only as 33·4 to 100), except Colobus and Ateles, in which the proportion is only one-fifth or even less.

The *index*, compared with the spine, is longest in Hylobates and Tarsius, where it approaches one-half the length of the latter. Then in Simia, Cheiromys, and Ateles, where it is considerably more than one-third. In the rest it varies between this and a fifth, except in Cercopithecus, the Cebidæ below Mycetes, Lemur, Galago, and the Nycticebinæ, being least in Perodicticus and Arctocebus, where it scarcely exceeds one-twentieth.

The *longest digit*, whether third or fourth, compared with the length of the spine, is greatest in Tarsius, Cheiromys, and sometimes Hylobates, where it exceeds one-half. The rest vary between this and one-fifth, except Cercopithecus, Chrysothrix, Lemur, Loris, and Arctocebus, being least in the last-mentioned, where the proportion is as about 16 to 100.

* Dr. Lucae found the pollex with its metacarpal to exceed that of Man in Macacus gelada, that of the Orang to be less than that of the Chimpanzee, and that of Hylobates to be greater than that of any other of the Simiinæ (*loc. cit.* pp. 307 & 317).

† In Perodicticus the pollex reaches somewhat beyond the middle of the proximal phalanx of the third digit; in Arctocebus it attains the ultimate phalanx of the third digit.

The Pelvic Limb.

The entire length of the pelvic limb, measured from the summit of the femur to the distal end of the longest digit, is absolutely greatest in Man, and then in the Gorilla, Orang, and Chimpanzee successively.

The absolute length of the leg, without the pes, is again longest in Man and the Gorilla; but in the Chimpanzee it is longer than in the Orang.

The entire length of the pelvic limb, compared with that of the spine, is greatest by far in Tarsius, the former being nearly twice and a half as long as the latter. Then follow Hylobates and Ateles, in which I find the pelvic limb to be more than once and three fifths the length of the spine. Man and Galago follow, the proportion being in them a little less than one and a half to one. Cheiromys and some of the Cebidæ and Hapale succeed, and in all, the limb is at least one-tenth longer than the spine, except in Lemur, Perodicticus, and Arctocebus. It is less than the spine in Lemur, and still less in Perodicticus, while in Arctocebus it is least of all—about 85·2 to 100.

The proportion borne by the limb, without the pes, to the spine is greatest in Tarsius, being more than once and a half the length of the latter, then Hylobates, once and a quarter, or a little more. In Man the proportion is as about 117 to 100. The limb is a trifle longer than the spine in Ateles, and scarcely shorter than it in Galago, Lagothrix, and Indris; in all the others it is above seven-tenths its length, except in Perodicticus and Arctocebus, in which it is as 65 to 100.

The proportion borne by the entire pelvic limb to the entire pectoral one is far greatest in Galago, where the first is considerably more than once and a half the length of the second. In Indris it is as about 144·5 to 100, in Man and Nyctipithecus as about 135. In the rest it is less, but still the pelvic limb is longer than the pectoral one, except in Ateles* and the Simiinæ, in which it is shorter†, being sometimes only as 75·2 to 100.

The length of the pelvic limb minus the pes, compared with that of the pectoral one without the manus, is greatest in Galago and Indris, the first being in each more than once and a half the length of the second. Man follows (145 to 100), then Callithrix and Nyctipithecus (about 137 to 100), and all the other forms have the pelvic limb the longer, except in the Chimpanzee, Ateles, the Gorilla, Hylobates, and Simia, the proportion in the last being only as about 73·4 to 100.

Os innominatum.

Throughout the order this bone consists of parts and processes homologous with those existing in Man; yet in him it assumes a form and proportions strikingly different from those existing in any other Primate.

* Professor Huxley notices the greater length of the pectoral limb in Ateles. See 'Medical Times,' 1864, vol. ii. p. 93.

† According to Dr. Lucae (*loc. cit.* p. 280) the proportion decreases in the following order:—Man, the Chimpanzee, Hylobates, the Gorilla, the Orang.

In absolute size this bone attains its maximum in the Gorilla *; it is next longest in the Chimpanzee, then in the Orang, afterwards in Man, and then in the largest Cynocephali; and there is even less difference in its length between the last and Man than there is between Man and the Gorilla.

The expansion of the ilium, as measured by the length of its crest, is again greatest in the Gorilla, and then in Man, who in this respect exceeds both the Chimpanzee and Orang. The Siamang follows these, and close upon it the Mandrill.

The part corresponding with the anterior margin of Man is longer than in him in all the largest Simiidæ, and sometimes in Ateles.

The pubic symphysis is actually longest in some Cynocephali, then in Troglodytes, Simia, and Man.

The conjugate diameter of the pelvis† is far greatest in the Gorilla, then in the Chimpanzee, Man, and the Orang.

Its transverse diameter is also greatest in the Gorilla.

The ilio-pubic angle, or that angle formed by the iliac part of the ilio-pectineal line with the anterior (in Man superior) margin of the so-called "horizontal" ramus of the pubis, varies from 88°, or even somewhat less‡, in Loris to 180 in Man.

That ilio-ischial angle formed by the superior part of the ilio-pectineal line with the superior (in Man posterior) margin of the ischium, is about 110° or 113° in Man; but in Apes and Lemuroids it varies from 140° to more than 180°, as also in some Cebidæ.

The angle formed by the same part of the ischium with the superior (in Man posterior) margin of the ilium is in Man about 140°, in Hylobates about 147°; in the rest it varies between this and 180°, which it attains in Troglodytes and Loris, but in Cynocephalus and some Cebidæ it is yet greater.

The extreme length of the os innominatum, when compared with that of the spine, is greatest in the Gorilla, where the former is decidedly more than one-half of the latter. It is also rather more than half in the Chimpanzee. In the Orang the proportions are as 45·8 to 100; in Hylobates, Ateles, Tarsius, Cynocephalus, and Lagothrix from 43·5 to 36·7; in Man and Cebus 32; the rest vary between this and 25, except Nyctipithecus, Callithrix, and Arctocebus, in which this bone is a trifle less than a quarter of the length of the spine.

The length of the inferior (in Man anterior) margin of the ilium between the spinous processes, compared with the length of the spine, is greatest in Tarsius and the Chimpanzee, where it is over one-fifth; the rest vary between this and Man, in whom it is considerably less than one-tenth.

Comparing the same margin with the total length of the os innominatum, the pro-

* Professor Owen remarks that it "would fit a human giant ten feet in height." Trans. Zool. Soc. vol. v. p. 12.

† Measured from the caudal end of the ventral surface of the first sacral vertebra to the symphysis pubis.

‡ Mr. John Wood, in his admirable article on the Pelvis in Todd's 'Cyclopædia of Anatomy and Physiology,' vol. v., gives 75° as the ilio-pubic angle of Loris. He calls attention to the great peculiarity in Man of the ilio-pubic angle being represented by a straight line.

portion is greatest in Tarsius, and the Lemuridæ other than the Indrisinæ. It is least in the Gorilla and Man.

The breadth of the ilium (as measured by a straight line drawn between its anterior —in Man superior—spinous processes), compared with the length of the spinal column, is greatest in the Gorilla, where it is more than three-tenths of the length of the latter. In the Orang and Man it is a little more than a fifth, and a trifle less in the Chimpanzee. In Hylobates it is about three-twentieths, and in the rest of the order it is between that and one-twentieth, except in Lemur and some of the Nycticebinæ, in which it is rather less.

The proportion borne by a line following the curve of the crest of the ilium to a straight one joining its anterior (in Man superior) spinous processes is greatest in Man, Hylobates, the higher Cebidæ, and the Chimpanzee and Gorilla. It is least in Galago, the Nycticebinæ, and Tarsius.

The length of a line extending from the ilio-pectineal eminence to the nearest point of the tuberosity of the ischium, as compared with that of the spinal column, does not vary much. It is greatest in the Gorilla, viz. as 21·8 to 100; then in the Chimpanzee, 17·7; in Man and Simia, 16; the rest vary between this and the proportion one-tenth, except Chrysothrix and the Nycticebinæ, where it is less.

The antero-posterior (in Man vertical) diameter of the acetabulum, as compared with the length of the spinal column, is greatest in the Orang, where it is as 8 to 100, then in Man and the Gorilla. It is smallest (under 3·5 to 100) in Arctocebus, Chrysothrix, and Hapale.

When the same dimension of the acetabulum is compared with the length of the os innominatum, the proportion appears to be greatest in Man, then in the Orang, and least in Hapale and some of the lower Simiidæ.

The length of the symphysis pubis, compared with that of the spine, appears subject to great variation in the same species; but it is greatest in the Simiidæ*, where it sometimes exceeds one-tenth; in the rest it ranges between this and one-twentieth, except in Man, Galago, Nycticebus, and Lemur, where it is a little less, and least of all in Arctocebus, Loris, and Perodicticus, where it is sometimes only as 1·7 to 100.

The length of the os innominatum, as compared with the greatest transverse diameter of the pelvis, is greatest in Loris, viz. as 442·4 to 100, then in the Pitheciinæ, 340·2 to 100; the rest vary between this and 211, except in Man, in whom, at least sometimes, it is a little under 2 to 1.

The breadth of the brim of the true pelvis, as compared with its conjugate diameter, is greatest in Man, where alone the former is in excess†, viz. as 105·5 to 100. Some-

* Professor Huxley remarks of Hylobates, "The subpubic arch, distinct in all the other great Apes, has almost disappeared, the symphysis pubis being inordinately long" (Med. Times, 1864, vol. i. p. 618). And of the lowest Simiidæ he says, "The symphysis is exceedingly long, the subpubic arch being very much reduced" (*loc. cit.* p. 672).

† Not always so, however, Professor Huxley has observed. See 'Medical Times,' 1864, vol. i. p. 344. See also Mr. John Wood's article on the Pelvis in Todd's 'Cyclopædia,' vol. v. pp. 150 & 151.

times in Cynocephalus the proportion is as 97 to 100, and it varies between this and 55 to 100, except in Arctocebus and Nycticebus, where the breadth is but very little above half the length, and in Loris, where it is even less than half.

The length of the os innominatum, compared with that of the scapula (measured from the anterior end, or summit of the glenoid surface to the posterior vertebral angle), is greatest in the Chimpanzee and some other Simiidæ, and is least in Man, the Orang and lower Cebidæ, Galago, Tarsius, Nycticebus, and Hapale.

The crest of the ilium undergoes a great change in form and proportion as we pass from one end to the other of the ordinal series.

Its length (measured along its curves) never equals half that of the os innominatum, except in Man and the Simiinæ; and, indeed, in Hylobates this is only sometimes the case. In Man alone does it nearly equal (and sometimes exceed) the length of the entire bone. It is at its minimum in Galago and the Nycticebinæ.

The breadth of the ilium, as measured by a straight line joining the points corresponding with the superior spinous processes of Man, exceeds half the total length of the os innominatum only in Man, the Gorilla, and the Orang, being respectively, to the latter dimension at 100, about as 69·8, 50·8, and 50·7 respectively.

The crest of the ilium is in some few forms much arched in a direction corresponding with that which is upwards in Man. This is especially the case in Hylobates, Mycetes, Ateles, and Lagothrix, and in a less degree generally in Man, Troglodytes, and Simia. In the other Anthropoidea it is but little so arched, the curve of the crest of the ilium being to a straight line joining its extremities as 126·4 to 100 on an average. In Indris and Lemur it is sometimes very slightly more arched; but in Galago, the Nycticebinæ, and Tarsius it is almost straight.

The lateral (in Man horizontal) curvature of the crest of the ilium presents a strongly-marked sigmoid flexure in none but Man, though in Troglodytes, and sometimes in Simia, there is a slight trace of such sigmoid curvature.

In the rest of the order the margin is all but, or quite straight, as in the Nycticebinæ; or there is but one lateral curve concave outwards, and this curvature is carried to its maximum in Ateles and Lagothrix (Plate XIII. fig. 1).

The crest of the ilium is generally thin, but more or less thickened at the points corresponding with the superior spinous processes of Man; in him alone, however, is it thickened at a point some distance behind the anterior superior spinous process, a thickened tract extending thence downwards to the acetabulum. In the lower Simiidæ (which have short iliac crests compared to those of Simiinæ) these crests are generally thicker relatively than in the latter. In the Cebidæ they are somewhat thinner, but the thickening at the ends is much marked in most Lemuroidea, though in the Nycticebinæ the very short crests are almost uniformly, as well as considerably, thickened.

The ventral (or anterior) margin of the ilium in Man is very short, but it is generally elongated and straight, or very slightly concave. It is, however, sometimes strongly concave in Troglodytes and Simia, still more so in Indris (Plate XIII. fig. 2), and

almost always much so in Lemur. It developes a slight prominence sometimes in Hylobates and the lowest Simiidæ, which prominence becomes much marked in Mycetes, Callithrix, Chrysothrix, and Hapale.

In certain Lemuroidea a peculiar condition obtains, in that the part answering to the ventral (or anterior) margin of the Anthropoidea runs obliquely backwards and upwards (in Man it would be downwards and backwards) over what is the external surface of the ilium so as to form an oblique ridge outside that bone, and reaching to the anterior (in Man superior) margin of the acetabulum, or even to a point above (behind) that cavity. This is the case in Galago, the Nycticebinæ (Plate XIII. fig. 3), and Tarsius, and an approach to the same condition is exhibited by Cheiromys.

There is a distinct superior anterior spinous process of the ilium in Man; but in no other primate is it so distinctly developed, but is represented only by the thickened end* of the crest of the ilium. In Indris and Lemur this is much produced in a direction which in Man would be forwards (Plate XIII. fig. 2).

The process of the ilium answering to the inferior anterior spinous one of Man attains its maximum of development in Indris, where it has a quite peculiar form (Plate XIII. fig. 2, *sp.*). Though sometimes indistinguishable, it is generally more or less marked throughout the order, especially in the Lemuroidea, except Tarsius and the Nycticebinæ, where it is minute or absent. Of all the Anthropoidea it is most marked in Man; in the Simiidæ it is little prominent, except in Cynocephalus, and in Ateles alone of the Cebidæ. In the latter family it often, as is also the case in Hapale, appears to be fused with the prominence which in them, as has been said, projects from the ventral margin of the ilium.

There is a distinct superior posterior spinous process in Man, but I have not found such in any other Primate, it being represented, in all the rest of the order, only by the more or less thickened upper (posterior) end of the crest of the ilium.

The part answering to the inferior posterior spinous process of Man is very rarely so sharp and distinct as in him†, and never so approximated as in him to the spinous process in front of (in Man above) it, except in Loris, the proportion borne by the distance between the processes to the length of the os innominatum taken at 100 being in Loris only 15·7 and in Man 17·7, while in the Gorilla it is 32·6, in the Chimpanzee 23·9, in the Orang 27·9; while in all the rest it is above 25, except in Tarsius, in which it is 23·9, and Nycticebus, where it is only 21·2.

The external surface of the ilium is generally more or less concave, and concave only. In Man, Troglodytes, and Simia, however, it is more or less convex, but in Man only is there that extensive anterior convexity and posterior concavity which determines the beautiful sigmoid curvature of the crest. The gluteal lines I have found distinctly marked only in Man.

* This is very thick sometimes in Simia, as in the specimen No. 3 c in the British Museum.

† I have found this process sometimes sharply marked in Cynocephalus, Ateles, Cebus, the Nyctipithecinæ Hapale, Indris, Lemur, Galago, and Tarsius.

This surface is most concave in Hylobates, the lowest Simiidæ, the Cebinæ, and Mycetes, less so in the other forms, and least of all in the Nycticebinæ, Tarsius, and Cheiromys, where there is either no external concavity at all, or only a very slight one near the crest of the ilium.

In the Nycticebinæ, Galago, and Tarsius, the part homologous with the outer surface of the ilium of the Anthropoidea becomes *exceedingly* small, as it forms only that part of the actual outer surface which is on the dorsal side of the oblique ridge, extending to the acetabulum, before mentioned (Plate XIII. fig. 3, *m*).

The internal surface of the ilium is generally narrow and flat, or only slightly concave. In none besides Man is it very wide, very concave, and directed entirely inwards. It is strongly concave in the Gorilla, however, and there is a very slight concavity in the Simiinæ generally, and sometimes in Cynocephalus, the Cebinæ, Mycetes, Hapale, and Indris. In the Nycticebinæ and Tarsius this surface is actually convex, by reason of the prominent ilio-pectineal line; but in Lemur, Galago, and Cheiromys the projecting spinous process near the acetabulum produces a concavity between that process and the ilio-pectineal line.

In the lower Cebidæ and Hapale the iliac fossa is extremely narrow.

The wall of the true pelvis, formed by the ischium, is generally elongated and narrow, but in Man and the Nycticebinæ (especially Loris) it is broad and short.

The auricular surface generally extends nearly to the crest of the ilium, and is especially high in the Cebidæ, the Nycticebinæ, and Tarsius. It is more distant from it in Man, Troglodytes, and Simia, and very much so in Lemur and Indris.

The ilio-pectineal line generally abuts against the first sacral vertebra, but sometimes against the second (as in Hylobates, Pithecia, and Chrysothrix), or between the two (as in some Cebidæ). In certain forms a ridge continues on as far as the crest of the ilium, ending near the part answering to the anterior superior spinous process of Man. This ridge is very marked in Indris and Lemur; and in Galago, the Nycticebinæ, and Tarsius it forms, as has been said, the actual ventral margin of the ilium (Plate XIII. fig. 3).

In Cebus the end of this ridge projects as a distinct and prominent process from the ventral end of the crest of the ilium, and a similar development is more or less marked in the lower Cebidæ and in Hapale.

The ileo-pectineal eminence is moderately marked in Man, as a rounded prominence. In Troglodytes it is sometimes absent, sometimes present as a distinct process, though more distant from the acetabulum, and nearer the symphysis, than in Man. In the Orang it is very large *, but in Hylobates there is only a slight ileo-pectineal prominence like that of Man. In the other Simiidæ it is not marked, except rarely in Cynocephalus.

In Mycetes there is sometimes a remarkable process, but it is not constant†, and in

* This is perhaps rather the *spine of the pubis* than an ilio-pectineal eminence.

† Present in the specimen in the Museum of the Royal College of Surgeons. That at the British Museum presents merely a trace of it.

the lower Cebidæ (*e. g.* Pithecia, Nyctipithecus) this eminence resembles that of Man. In Indris there is a certain thickening near the inner end of the acetabulum *; but in Galago a distinct small process is developed near to, but separated from, the spine of the pubis. In the Nycticebinæ a sharp-edged, ridge-like prominence appears to answer to both the last-mentioned processes united. The ileo-pectineal eminence is absent, or *very* slightly marked in Lemur, but it is rather marked in Cheiromys †.

The spine of the pubis is a less constant process. It is generally well developed in Man, but is indistinguishable in Troglodytes and Simia‡. On the other hand, it is immense in the Siamang, and large in almost all Hylobates. In the lower Simiidæ it is generally absent, and but very rarely much developed §, and appears to be absent in the lower forms of the order, except that in Indris there is sometimes a minute process (quite close to the symphysis), and in Galago a distinct projection like a second ilio-pectineal eminence.

The so-called horizontal ramus of the pubis has its anterior (in Man superior) surface very narrow, forming a sharp ridge, except in the Simiinæ and Man. Of all Apes it is broadest and most flattened in the Gorilla, but never in that species it is so much so as is generally the case in Homo.

The body of the pubis is relatively longer and more antero-posteriorly extended in the Simiidæ and some Cebidæ than in Man and most Lemuroidea; but in Loris it is at its maximum of development in the whole Order.

The subpubic groove, which is generally so marked a feature in the human os innominatum, is very rarely present in any other form. It is distinct, however, in the Gorilla, Orang, and Siamang, and is slightly marked in other species of Hylobates. I have only observed it besides in Mycetes and Lagothrix.

The ascending ramus of the ischium is very slender in many Lemuroidea, especially in Loris; it is broader in Man and the Cebidæ; but in the Simiidæ, especially in the Gorilla, Hylobates, and Cynocephalus, it becomes exceedingly broad, concave externally, and with an everted posterior (inferior of Man) margin.

The tuberosity of the ischium is always a marked and more or less rugose enlargement of the bone; but in the Simiidæ below Simia it is flattened and very much developed, and so much everted that sometimes (in Cynocephalus) its transverse exceeds its antero-posterior diameter. In Hylobates it is continued inwards almost to the symphysis pubis. In Troglodytes and Simia it is much larger than in Man, but not flattened; in the Cebidæ and Lemuroidea it is small and more or less rounded, but in none, except some of the Nycticebinæ, is it prolonged upwards near to the acc-

* De Blainville, 'Ostéographie,' Lemur, p. 11, speaks of a large ileo-pectineal spine in Lemur; but from what he says of Indris (p. 22), he evidently means the process corresponding to the anterior inferior spinous process of Man.

† Owen, Trans. Zool. Soc., vol. v. p. 53, and pl. 21, figs. 19 & 20.

‡ Unless what has been spoken of as an *ilio-pectineal eminence* be really the spine of the pubis.

§ As in the specimen No. 4720 in the Osteological Collection of the Royal College of Surgeons.

tabulum and spine of the ischium as in Man, Loris especially resembling the human structure in this. Of all the other Anthropoidea, Lagothrix perhaps makes the nearest approach to Man and Loris as to the tuberosity of the ischium (Plate XIII. fig. 1).

The spine of the ischium is generally very small yet distinct. In European Man it presents a development much greater than that existing in any other Primate, though sometimes the Orang rivals certain of the inferior races of mankind in this respect. It is never so sharp a process, however, as it always is in Man. In Mycetes and Nycti-pithecus the spine of the ischium is hardly distinguishable.

The great sciatic notch is never very deep and concave, except in Man. Of all besides, it is most concave in the Gorilla, Orang, and Cynocephalus. It is rather strongly so also in Indris.

The lesser sciatic notch is generally represented by a margin which is so slightly concave as to be almost or quite straight, or even, as sometimes in Cynocephalus*, slightly convex; though in the lower Simiidæ a concavity is often occasioned by the eversion of the tuberosity. The projection of the spine of the ischium produces in Man a deep notch such as exists in no other Primate.

The acetabulum presents no very marked differences, but it is at its maximum of relative as well as absolute size in Man, Troglodytes, and Simia. It is largest and deepest, especially at the dorsal and towards the ventral side, in Man. In some of the Cebidæ (*e. g.* Ateles, Lagothrix, Mycetes, Pithecia, and Callithrix) it is very shallow, and it is so besides in Indris. In all species it is deepest at the part corresponding with the upper wall of Man.

The cotyloid notch and the excavation continuous with it are constantly present throughout the order, even in Simia† (where there is no *ligamentum teres*), though very small and narrow in that genus. In those skeletons of the Gorilla in which I have seen no trace of a depression for the round ligament on the head of the femur, the inner surface of the acetabulum is as usual‡, or is but little less marked §. The notch is narrow in Ateles, but in Nycticebus it is sometimes relatively enormous ‖.

The general contour of the outer margin of the ischium, when the pelvis is viewed in front, is almost always more or less strongly concave. It is most so in the Gorilla and lowest Simiidæ, but very little so in Ateles, less in Lagothrix, and still less in the Nycti-cebinæ; in Loris and Nycticebus, as in Man, being positively convex from the prolongation upwards of the tuberosity.

In all the Anthropoidea, except the Simiinæ¶, about two-thirds of the acetabulum are visible when the outer surface of the ilium is looked at, but in the Simiinæ it is only

* *E. g.* No. 4719 in the Osteological Collection of the Royal College of Surgeons.

† Its presence in the Orang has been noticed by Mr. John Wood (Todd's Cyclopædia, vol. v. p. 153).

‡ See No. 5179 A. College of Surgeons Museum.

§ See No. 5179 B. College of Surgeons Museum.

‖ See Nycticebus javanicus in British Museum.

¶ This condition in Troglodytes is noticed by Professor Owen (Trans. Zool. Soc. vol. v. p. 14).

seen in profile. In the Lemuroidea more of the acetabulum is visible than even in any of the Anthropoidea, if the whole of the actual outer surface of the ilium be in view.

The number of vertebræ with which the ilium articulates varies from one to four. Two is the usual number; but in Man, Troglodytes, Hylobates, Cynocephalus, Ateles, and Lemur four sometimes so unite.

The obturator foramen offers no very definite characters, but varies greatly from individual to individual. It is of great relative size, however, in Loris and Nycticebus.

The pubic symphysis forms an angle with the spinal column, open towards the head, not only in Man, but also in the Siamang, where it is about 43°. The pubis also appears sometimes to form a similar but smaller angle (about 25° or 30°) in Cynocephalus.

The brim of the pelvis is generally broadest between the acetabula. Sometimes in the Cebidæ it is so below those cavities, but only in Man, and not always in him is the outline of the brim heart-shaped.

The breadth of the true pelvis, as compared with the length of the spinal column, is greatest in Man and the Simiinæ (from 19·6 to 15 as compared with 100). In the rest the proportion is above 8 to 100, except in Pithecia, 7·5, and Loris, in which it is smallest, namely, only as 5·7 to 100.

The inferior outlet of the pelvis in Man is very small as compared with other Primates, from the relatively forward position of the sacrum *. Its height is in greatest excess in proportion to its breadth in the Nycticebinæ, especially in Loris.

Femur.

Throughout the order the femur has a great general resemblance to that of Man.

As regards absolute size, its length is considerably greater in Man than in even the largest of the Apes; but both in the transverse and antero-posterior diameters of the shaft near its middle, as well as in the width between the supracondyloid prominences, the Gorilla exceeds him.

The length of the femur, as compared with that of the spine, is far greatest in Tarsius, namely, as 81·9 to 100. The proportion is next greatest in Hylobates, about 67·8; then in Man, 64·9; Ateles, 61·4; and the Gorilla, 54·0. The other forms are between the last-mentioned proportion and that of 40 to 100, except Lemur and Hapale, which are a little less, and Arctocebus and Perodicticus, in which it is under 34·0 to 100.

The proportion of the length of the femur to that of the humerus is again far greatest in Tarsius, the first being more than double the second. Indris follows, and then Galago, in both of which, especially the former, the length of the femur is considerably more than once and a half that of the humerus. In some Semnopithecinæ and in Lemur it is but little less than as one and a half to one, and in Man about as 138·0 to 100. In all the rest it varies between the last-mentioned proportion and that of Loris (113·3 to 100), except in the Simiinæ, in all of which the femur is shorter than the humerus, and most so in the Orang.

* Wood, *loc. cit.* p. 152.

The proportion borne by the transverse diameter of the femur to its length is far greatest in the Gorilla, where it is more than a tenth, and but little less in the Chimpanzee and Orang. In the rest it is as much as one-twentieth, except sometimes in Hylobates, and in Tarsius.

The shaft of the femur is very often almost completely straight, as in Hylobates generally, and in most Cebidæ and Lemuroidea. It is decidedly curved, with the concavity backwards, in Man, Troglodytes, the lower Simiidæ, and sometimes in Hapale.

It is slightly curved, with the concavity forwards, in the Nycticebinæ, and sometimes in Lemur.

In all the Anthropoidea, except Hylobates, a straight line cannot be drawn from the most prominent point of the great (peroneal) trochanter to that of the condyles without cutting or meeting the front surface of the shaft; but in all the Lemuroidea this can easily be done.

The lateral expansion of the shaft downwards takes place gradually in the Gorilla and generally in Hylobates, in Mycetes (Plate XIII. fig. 4), the Pitheciinæ, Nyctipithecus, Callithrix, sometimes in Lemur and in Loris. It takes place suddenly in Man, the Chimpanzee, and mostly so in the lower Simiidæ; but it does so to a marked degree in Indris, Galago, Arctocebus, Perodicticus, andTarsius.

The shaft is especially angular in Man, the *linea aspera* being so prominent in none others as in him. Nevertheless the shaft is decidedly angular in Cynocephalus, and sometimes in Lemur. The *linea aspera* is also very distinct sometimes in Hylobates* and the lower Simiidæ as a longitudinal median groove bounded by two raised lips; these are very distinct also in Ateles and Mycetes.

The shaft is sometimes much compressed antero-posteriorly in the Gorilla and Orang, also in Mycetes and the Pitheciinæ. In Tarsius it is laterally compressed.

In the other genera it is more or less completely cylindrical.

The ridges, which in Man proceed from the *linea aspera* to the condyles, are rarely much marked in other species. That going to the inner condyle, which is moderate but distinct in Man, Cynocephalus, and Mycetes, is very faint or absent in all others. The branch going to the external condyle, which in Man is very prominent, is so in no other Primate, but almost or quite disappears, except in Troglodytes and Cynocephalus.

The neck of the femur is especially long and well defined in Man and the Simiinæ, but least so of these in the Gorilla. It is particularly short in Hapale and the Lemuroidea, especially in Indris, Galago, the Nycticebinæ, and Tarsius.

The great (peroneal) trochanter is generally pointed at its upper end, but in Man and the Simiinæ, Mycetes and Perodicticus, I have found it truncated. It is smaller in Ateles than in most other Anthropoidea, but it is particularly small in Galago and the Nycticebinæ. Its extremity often projects forwards, especially in Hylobates, Cebus, Hapale, Lemur, Perodicticus, and Tarsius. It sometimes rises higher than the summit of the head

* *E. g.* No. 5026 in the Museum of the Royal College of Surgeons.

of the femur in the Gorilla, and generally does so to a slight extent in the lower Simiidæ, though sometimes it is not quite so high as that summit. It rises considerably above it in Indris and Lemur. It does not reach it by a considerable interval in Man, the Orang, sometimes in Hylobates, and in Ateles.

It generally projects outwards beyond the general external margin of the shaft of the femur, but it does not do so in the Gorilla, Ateles, and Lagothrix, nor in Arctocebus, nor, sometimes, in Hylobates and Loris.

The external margin of the peroneal trochanter more or less blends with a marked gluteal ridge in Man and the lower Simiidæ and most Cebidæ. In Hapale this ridge is very prominent, as also in Lemur, Galago, and Tarsius, in the three last developing a third trochanter.

In all the Lemuroidea, except sometimes in the Nycticebinæ, there is at least a trace of a third trochanter, and such a process is even rarely present in Hylobates *.

In Troglodytes and Simia there is often a marked concavity at this part.

The trochanteric fossa, which is rather shallow in Man, is particularly so in the Gorilla and Perodicticus. In the other forms it is deep, and in the Anthropoidea, is generally deeper relatively in the other genera of the suborder than in Homo. In the Lemuroidea it is small, especially in Galago, Arctocebus, Perodicticus, and Tarsius.

The lesser (tibial) trochanter is at its minimum of relative size in Man and the Simiinæ, except that sometimes in Hylobates it becomes very prominent †. In Hapale it is larger, relatively, than in any other of the Anthropoidea. In the Lemuroidea it is always very large, even sometimes exceeding in extent the peroneal trochanter. This is the case in the Nycticebinæ ‡, especially in Perodicticus and Arctocebus, where it is a large plate-like process, and attains the maximum of relative size in the whole order.

In the Anthropoidea this process is always at a greater distance from the head of the bone than in the Lemuroidea, and it is most approximated to it of all in Loris.

I have found only the anterior intertrochanteric line strongly marked in Man and the lowest Simiidæ, but it is faintly indicated sometimes in Chrysothrix, Indris, Lemur, Galago, Loris, and Tarsius.

The posterior intertrochanteric line is most prominent in the lower Simiidæ, then in Man and the Orang, and then in the other Simiinæ.

In Hapale the posterior surface of the femur between the trochanters is wide and flat (Pl. XIII. fig. 5), presenting an appearance existing in no other genus of the Anthropoidea, but very like that of all the Lemuroidea, where this large flat or concave surface serves for the extensive insertion of the *quadratus femoris* muscle.

The head of the femur is of a remarkably large relative size in the Orang, and it is also large in Indris. Sometimes, instead of being rounded, it is peculiarly compressed

* *E. g.* No. 5026 in the Museum of the Royal College of Surgeons.

† *E. g.* Nos. 5027 and 5027 A in the same museum.

‡ De Blainville remarks its great size (*l. c.* p. 16).

transversely. This is the case in the Nycticebinæ, especially in Nycticebus, and somewhat so in Tarsius.

The head is much inclined forwards in the Siamang, and in Indris also, though to a less extent; sometimes it is much so in Cynocephalus and in Man.

The pit for the insertion of the *ligamentum teres* is always present except in the Orang (in which it is almost constantly absent)*, and sometimes in the Gorilla †. It is larger and deeper relatively in the lower Simiidæ than in Man, and it is very large in Ateles. On the other hand, it is small in Indris and Lemur; and there is but a faint indication of it in Perodicticus, though it is large in Arctocebus and enormous in Nycticebus.

The condyles are prolonged backwards about equally in Man, and are nearly equal in size, and in most forms the outer one is but little smaller or less prolonged backwards than the inner one. In the Simiinæ, however (especially the Gorilla and Hylobates), as also in Ateles, Lagothrix, Indris, Arctocebus, Perodicticus, Cheiromys, and sometimes in Lemur, the internal condyle projects considerably further backwards than does the external one.

Supracondyloid prominences are more or less strongly and sharply marked in Man and the Simiinæ ‡. They are less so (except perhaps in some of the higher and larger Cebidæ) in the other Anthropoidea, and in the Lemuroidea; it is only in the Nycticebinæ that they become rather prominent and pointed.

In Tarsius the femur is exceptionally narrow at this part.

The intercondyloid space behind is especially wide in the Simiinæ and Pitheciinæ, and rather much so in Loris and Perodicticus. It is sometimes very shallow, as in Ateles.

The rotular surface is generally moderately concave from side to side, and is especially shallow in the Simiinæ and Nycticebinæ. It becomes deeper in Man and in most Anthropoidea, but in the Lemuroidea this deepening is carried much further, especially in Tarsius. The parts of this surface supported by the two condyles respectively are almost always pretty nearly of the same size; in Man alone the part supported by the external condyle has a great predominance over the other. In the Lemuroidea, other than the Nycticebinæ, however, the external margin of the rotular depression projects much more than does the internal one, especially in Indris.

The depression serving for the origin of the *plantaris* muscle is, as far as I have been able to observe, deepest in the Chimpanzee and sometimes in Hylobates. In the other Anthropoidea it is only slightly marked, and in the Nycticebinæ is altogether absent §.

* I find in the skeleton of an Orang, No. 3 *i* in the Osteological Collection of the British Museum, that each femur exhibits a small but distinct impression on its head, in the place occupied in other genera by the pit for the round ligament. See Trans. Zool. Soc. vol. vi. pl. xl. fig. 7 *i*.

† *E. g.* in the femora of the skeletons Nos. 5179 A and 5179 B in the Museum of the Royal College of Surgeons.

‡ In Man the inner one is the larger, in Troglodytes the outer one. See Owen, Trans Zool. Soc. pp. 14–18, and pl. 7. figs. 1, 4, 6.

§ The muscle itself being absent (Proc. Zool. Soc. 1865, p. 251).

The pit for the tendon of the *popliteus* is generally marked, and is deep in Troglodytes, Simia, Cynocephalus, and Man; also in Ateles, Mycetes, Cebus, and Hapale. It is very deep and large in the Nycticebinæ, and appears to attain its relative maximum in Nycticebus.

The depression for the internal lateral ligament seems less marked in Man than in the other Anthropoidea. Of the Lemuroidea I have found it very marked in Perodicticus and deep in Lemur.

The angle formed by the neck of the femur with its shaft varies from about 155° (Simia) to 128° (the Gorilla) or 125° (Indris).

The angle formed by the shaft of the femur with a horizontal surface on which both condyles are made to rest, varies from about 103° in Man to about 90° in the Chimpanzee. This angle measures the descent of the inner condyle beyond the outer one, which is greatest in Man, though very considerable in others, as, *e. g.*, sometimes in Cynocephalus, and especially Ateles *.

Tibia.

In the whole of the Primates the tibia is an elongated bone, considerably enlarged at its proximal end, and less so at its distal extremity.

Except in the genus Tarsius, it never anchyloses with the fibula.

There is generally a distinct tubercle giving attachment to the ligament of the patella, and the external (peroneal) surface of the bone is almost always more or less excavated for the reception of the *tibialis anticus* muscle.

The posterior surface of the lower end of the bone has generally two distinct grooves, one for the passage of the tendons of the *tibialis posticus* and *flexor longus digitorum* muscles, the other for that of the *flexor longus hallucis*.

The tibia has the greatest absolute length in Man, to whom the Gorilla in this respect succeeds, but the breadth between the tuberosities is greatest in that Ape, Man being only second.

The length of the tibia (measured to the extremity of the malleolus), compared with that of the spine, varies from more than four-fifths, as in Tarsius, to scarcely more than three-tenths, as in Perodicticus and Arctocebus. In most, however, it is between two-fifths and one-half the length of the spine.

Its length is generally a little less than that of the femur, but it sometimes slightly exceeds it. In Cynocephalus, Troglodytes, and Nycticebus it is decidedly shorter, being to the femur in length as less than 85 to 100; but only in Man does the proportion fall so low as 80·5 to 100.

The length of the tibia, as compared with that of the humerus, is greatest in Tarsius, where it is more than twice as long, and then in Indris and Galago, where it is more than, or almost as much as, once and a half as long. In all, the femur's length exceeds that of the humerus, except in Mycetes, Ateles, Lagothrix, and the Simiinæ, being

* See the specimen No. 4708 in the Osteological Collection of the Royal College of Surgeons.

least of all in the Orang, where the length of the femur is less than seven-tenths of that of the humerus.

The proportion in length borne by the tibia to the radius is greatest, again, in Tarsius, viz. as 163·8 to 100. In Hapale it is as about 158·6, in Man about 150·5 to 100, and in Callithrix as 149·1. In all the rest the length of the former bone is in excess, or the two are equal, except sometimes in Cynocephalus, and in Ateles and the Simiinæ.

The breadth between the tuberosities, compared with the extreme length of the tibia, varies from about 28·5 to 100, as in the Gorilla, to only 9·8 to 100, as in Tarsius.

The antero-posterior diameter of the shaft also, compared with the length of the bone, varies from about 14·6 to 100 in the Gorilla, to about 6 to 100 in Loris.

The tibia is most laterally compressed in Tarsius, most cylindrical in Loris. It is most massive in Troglodytes and Simia.

The tubercle of the tibia is more distinctly prominent in Man than in other Primates. It is situated higher up, as regards the rest of the bone, in him than in any other of the Anthropoidea. In Indris it is as high up as in Man, and in Tarsius it is still higher.

The smooth surface above the rough projection of the tubercle is larger in the Simiinæ than in Man.

The tuberosities project out considerably on each side, except in Tarsius; and in most Primates the peroneal one projects outwards more strongly than it does in Man. A process is sometimes developed above the surface for the *tibialis anticus*, and projects sharply outwards. This is well seen in the Lemuroidea, except Tarsius, and is visible also in Mycetes. The amount of projection of the inner tuberosity varies but little, except that in Tarsius it is *very* slight.

The articular facets for the condyles of the femur rarely occupy the summit of the tibia so completely as in Man.

The outer facet is always decidedly convex antero-posteriorly, except in Ateles, Lagothrix, Indris, and Man, where it is flat or slightly concave antero-posteriorly.

The inner facet is almost always concave antero-posteriorly as well as transversely, but it is almost quite flat in Indris, while sometimes in the Lemuroidea (*e. g.* Galago and Perodicticus) its posterior part inclines strongly downwards.

The spine is always of moderate height, much as in Man, but is longest relatively perhaps in Indris.

The peroneal surface of the shaft is often much excavated for the *tibialis anticus*, and most so in Lemur.

The crest of the tibia is sometimes very prominent, as in Tarsius, Man, Lemur, and Indris. It is generally much sharper, however, in Man than in any other Primate.

The shaft of the tibia may be straight or variously curved. It is straight, or almost so, in Man, Lagothrix, Pithecia, Indris, and more or less so in Ateles and the Orang. It is considerably curved, convex forwards, in the Gorilla, the lower Simiidæ, and Lemur.

It is rather convex outwards in the Nycticebinæ. Sometimes there is a sigmoid vertical curvature, as in Nyctipithecus, Hapale, Indris, Galago, and Tarsius.

The ridge for the *popliteus* is very rarely distinguishable in any Anthropoidea except Man. In the Lemuroidea there is generally a marked vertical ridge at the upper part of the posterior surface of the tibia. This appears to attain its maximum in Arctocebus and Perodicticus.

The ridge for the interosseus membrane, which is so strongly marked in Man, is not distinct in the Simiinæ or higher Cebidæ, but it is more so in other Simiidæ and Cebidæ, and in Hapale. Sometimes in Lemur it is strongly marked, but not in any of the Nycticebinæ.

The malleolus is generally well developed, but sometimes, as in the Orang, very short. It is long in Cynocephalus, Lemur, Galago, and Cheiromys, and in some (the Nycticebinæ) it is much pointed, incurved, and antero-posteriorly compressed, with its articular surface very convex. Moreover, it seems rather to spring from the front than from the inner side of the shaft of the tibia, as is very well seen in Perodicticus.

The articular surface of the malleolus is sometimes nearly at right angles with the inferior surface of the shaft of the tibia, as in Man, the Chimpanzee, and the lower Anthropoidea; sometimes it forms an obtuse angle with that surface, as in the Gorilla, and still more in the Orang.

A groove for the tendon of the *tibialis posticus* marks the back of the malleolus; this attains its maximum of enclosure and relative depth in the Nycticebinæ, where the portion of bone which separates it from the (also strongly, though less marked) groove for the *flexor longus hallucis* has the appearance of a prominent process.

The distal articular surface of the shaft of the tibia is horizontal transversely in Man, Ateles, and Lagothrix. In the Simiidæ and lower Cebidæ the outer portion rises so that the articular surface slopes upwards and peronead; and this is still more the case in the Lemuroidea.

As regards the anterior and posterior margins of this articular surface, they descend in general about equally; but in some Cebidæ (*e. g.* Callithrix) and Lemuroidea (*e. g.* Lemur, Galago, Tarsius) the anterior border descends a little further than does the posterior one. On the other hand, the posterior margin descends considerably more than does the anterior one in Man, and might be supposed to do so in the Nycticebinæ, on account of the projection in the latter of the process of bone separating the grooves for the flexor tendons.

This inferior articular surface is generally subquadrate with a median antero-posteriorly directed prominence. In the Lemuroidea it tends to approach a triangular form, and the prominence in the Nycticebinæ (*e. g.* Loris) becomes very large.

The pit for the insertion of the tendon of the *semi-membranosus* is generally distinct, but often slight, as generally in Lemuroidea, though in Arctocebus it is very strongly marked. It is only in Indris that I have observed a tubercle projecting downwards immediately beneath it.

No constant characters appear to exist as to the medullary foramina, which are one or two in number, near the middle or upper part of the back of the shaft, on the peroneal side of the bone. The artery always enters from above downwards.

The Patella.

This bone offers few marked or constant noteworthy characters.

It is generally oval, but is rounder and relatively thicker in the Gorilla than in Man; it is very small and round in the Orang.

It is longer and narrower in Mycetes than in most other Anthropoidea, but it attains its maximum of relative length in Indris, where it tapers downwards, and is so bent that the upper and lower halves of its outer (anterior) surface form together an angle which sometimes approaches 90°.

It is long also in Lemur and Cheiromys*, but it is small in the Nycticebinæ and Tarsius.

Fibula.

This bone is always distinct from the tibia, except in Tarsius, where its lower half anchyloses with the tibia, which thus appears to furnish both the malleoli.

Its length varies with that of the tibia; and it is always very much more slender than that bone, especially in Man, Ateles, Hylobates, Indris, and Microrhynchus †.

The fibula is generally nearly straight, but curves slightly in one direction or in another. In Man it is very decidedly concave forwards, and a similar curvature, though less marked, exists in the lower Simiidæ, Pithecia, and Loris. I have observed it convex forwards in the Orang, Ateles, Mycetes, Indris, Lemur, and Galago, and convex outwards in Hylobates, Chrysothrix, Indris, and Lemur. But there is, I believe, but little constancy in this character.

The outer side of the head of the fibula may be convex, flat, or slightly or deeply concave, and the articular surface for the tuberosity of the tibia may also be flat or slightly or strongly concave. The head of the fibula is much expanded in the Nycticebinæ, and articulates with the tibia by an antero-posteriorly elongated groove.

The malleolus is generally much produced outwards, and projects about as much as, or rather less than, the tibial malleolus, except in Man, in whom alone the external (or peroneal) one is much deeper than the internal malleolus.

The under surface of the malleolus has generally a more or less marked fossa, but the presence and size of this are very irregular and inconstant. The malleolus is often grooved behind for the tendons of the *peronei* muscles, especially in Nycticebus.

The lower articular surface for the tibia varies but slightly in extent.

The fossæ, which more or less excavate the surface of the fibula, and the ridges which divide them, are in no Primate developed to such a degree as they generally are in Man. Yet Simia, the Gorilla, and Cynocephalus approach him rather nearly in this respect.

* Owen, Trans. Zool. Soc. vol. v. pl. 19.

† Proc. Zool. Soc. 1866, p. 165.

Often, in small species especially, there are no distinctly marked fossæ, but very generally there is a depression, on the tibial side towards the summit, which sometimes (as in Galago and Perodicticus) extends far down.

Very generally there is an anterior ridge, and often a posterior or external one also.

Pes.

The absolute length of this segment is greatest in the Orang and Gorilla, then in Man, and afterwards in the Chimpanzee. In Indris and some other lower Simiidæ it is absolutely longer than in Hylobates, except the Siamang.

The proportion borne by the whole length of the pes to that of the spine is far greatest in Tarsius, where the first is more than four-fifths of the latter. In Cheiromys, Ateles, Simia, and Galago, the length of the pes is more than half that of the spine. All the rest exceed the proportion borne by Man (which is about 35·4 to 100), except Lemur and the Nycticebinæ. In Cynocephalus, however, the proportion is almost the same as in Man.

The length of the pes, as compared with that of the rest of the pelvic limb, is greatest in Simia, Cheiromys, and Tarsius, where the first is decidedly more than half the second. In Galago, Hapale, and Nyctipithecus it is about half; in the rest it is between this and two-fifths, except in Hylobates, sometimes in Cynocephalus, and in Man.

The proportion borne by it to the tibia is greatest in Simia, where it is more than one-fifth longer than the latter. It approaches this proportion in Cheiromys, and the pes is considerably longer than the tibia in Galago and Tarsius also. In all the rest the pes is more than four-fifths of the length of that bone, except in Hylobates, the Nycticebinæ, and Man.

The length of the pes, compared with that of the manus, is far greatest in Chrysothrix and Galago; the rest are intermediate between the latter genus and Ateles (where the proportion is as about 113·6 to 100), except the Chimpanzee, Cheiromys, and, last and least, Hylobates. In these alone, and not always in the Chimpanzee, is the pes shorter than the manus.

Tarsus.

The absolute length of the tarsus of Man exceeds that of every other Primate, though that of the Gorilla approaches his very nearly.

Its length in proportion to the spine is far greatest in Tarsius, where it almost equals two-fifths of the length of the latter. In Galago it is nearly one quarter; then follow Cheiromys, Man, and the Gorilla, where it is more than three-twentieths. The rest vary between this and one-twentieth (which Indris, Lemur, and Loris scarcely exceed), except Arctocebus.

The length of the tarsus, as compared with that of the entire pes, is greatest in Galago, and then in Man and Tarsius, in all of which the first is between one-half and two-fifths

of the latter *. In the rest the proportion is less, but is still above 3 to 10, except in Mycetes, Hapale, Hylobates, Indris, Ateles, and Simia.

The length of the tarsus, as compared with that of the carpus, is far greatest in Tarsius and Galago. It is least in Simia, Arctocebus, and Hylobates.

The tarsus, besides sesamoids, always consists of seven bones only, except that, according to Van Campen †, an extra ossicle is developed in the transverse ligament enclosing the flexor tendons.

The tarsal bones almost always form an arch, both antero-posteriorly and transversely, but only in Man is the former so extended that the distal ends of the inner metatarsals form the anterior point of support. It must be remembered, however, that in him this is only the case as regards the tibial, or inner side of the foot. The fifth metatarsal is applied to the ground at its proximal end; and thus Man, like the lower Primates, puts the outer part of the tarsus and metatarsus to the ground ‡.

The transverse arch is very marked in all Anthropoidea, it is less so in some of the other suborders.

Os Calcis.—The calcaneum is absolutely longest in the Gorilla §, but it is nearly as long in Man.

Its length in proportion to that of the spine is far greatest in Tarsius, namely, as 36·4 to 100; then in Galago, where it is just under one-fifth of the length of the spinal column; and then in the Gorilla and Man, where it is a little more than one-tenth. In the rest it varies between this proportion and one-twentieth, which is about that of Perodicticus and Arctocebus.

The tuberosity at its extremity is generally produced upwards or downwards, or both. It is produced both upwards and downwards in the Chimpanzee, Orang, Ateles, Lagothrix, and Mycetes, and more or less so in Arctocebus and Perodicticus. It is produced downwards only in the Gorilla and Loris, upwards only in the lower Simiidæ and Cebidæ, Hapale, Indris, and Lemur.

It (the tuberosity) is broadest at its plantar end in Man, and sometimes in the Gorilla; generally it is so at its middle, as in Simia and Ateles, or towards its upper end, as in the lower Simiidæ. In Hylobates it is sometimes as broad below as above.

In Man and the Gorilla the tuberosity is convex behind; it is concave in the Chimpanzee and in Hylobates; and in most of the forms below that genus it is vertically grooved behind. This is not the case, however, in the Nycticebinæ.

* Dr. Lucae estimates the tarsus by measuring it in front of the articular surface for the tibia, while I employ its extreme length from the tuberosity of the os calcis to the distal margin of the ecto-cuneiforme. Hence there are necessarily discrepancies between the results obtained by us.

† See 'Verhandelingen der Koninklijke Akademie van Wetenschappen.' Zevende Deel, 1859, p. 21, and plate 1. fig. 8*.

‡ Professor Huxley has called attention to this fact in his lectures at the Government School of Mines; and Mr. Henry Hancock, in his lectures on the anatomy and surgery of the foot, remarks, "The external margin, in standing, rests for the most part on the ground" (Lancet for June 1866, vol. xxiii. p. 618).

§ Professor Owen remarks that it is longer than in Man (Comp. Anat. of Vertebrates, vol. ii. p. 550).

In none is the long axis of the heel, or are the peroneal and tibial surfaces of the os calcis so vertical as they are in Man, but the bone is generally twisted, so that the *sustentaculum tali* forms a more or less acute angle with the long axis of the tuberosity; in Man, however, it is a rectangle. This twisting of the os calcis is very slight in the Orang and Pithecia, and not great in Ateles and Hylobates. It is more marked in the lower Simiidæ, and considerably more so still in Troglodytes. Amongst the Lemuroidea it is less so in Tarsius, Cheiromys, and Indris than in others, but it reaches its maximum in the Nycticebinæ, where, in Perodicticus, the *sustentaculum tali* is almost, if not quite parallel with the long axis of the tuberosity.

Concomitantly with this intwisting, the part answering to the inner face of the human calcaneum generally becomes more concave (though scarcely if at all more so in the Gorilla than in Man), reaching its maximum in Loris, where the tuberosity bends round and meets the posterior margin of the astragalus.

Again, a narrowing of the part which answers to the plantar surface of Man, also accompanies this intwisting. This part, indeed, becomes reduced to a narrow ridge by the approximation below of the inner and outer surfaces of the os calcis, and even in the Gorilla it is considerably narrower than in Man *.

The antero-posterior concavity of this plantar surface is very great in Troglodytes, being in both species greater than in Man † (Plate XIII. fig. 6), as also in the Nycticebinæ. On the other hand, in the lower Simiidæ and Cebidæ, Hapale, Indris, and Lemur, this surface is generally almost or quite level antero-posteriorly.

The length of the tuberosity behind the posterior margin of the posterior articular surface for the astragalus, is much longer than that surface in the Gorilla (Plate XIII. fig. 6), often so in the lower Simiidæ, and sometimes in Cebus, very slightly so in Perodicticus, and perhaps also in Tarsius ‡.

In Man the tuberosity about equals, or rather exceeds the same posterior articular surface, but never (except perhaps in some Negroes) equals the predominance attained in the Gorilla, where the part behind the posterior surface for the astragalus exceeds in length all the bone anterior to the hinder border of that posterior articular surface, and in this respect the Gorilla may be said to have the longest heel of any Primate (Plate XIII. fig. 6).

In the Galago the part behind this posterior surface for the astragalus about equals in length the antero-posterior dimension of that surface. In forms other than those before mentioned, it falls short of it; in Simia it is only half of it, and in Loris even much less than that.

The length of the heel behind the posterior articular surface for the astragalus

* But in the Gorilla, as Professor Huxley observes, "the calcaneum retains its narrowness and the single tubercle" (Medical Times, vol. i. p. 537). The two plantar tubercles of the plantar surface of the os calcis are only found distinct in Man.

† Its greater concavity is noticed by Professor Owen (Comp. Anat. of Vertebrates, vol. iii. p. 550).

‡ See Burmeister's 'Tarsius,' pl. 1.

exceeds that of the part of the os calcis altogether in front of that posterior articular surface, slightly in the Chimpanzee, greatly in Man; and in the Gorilla the first is more than double that of the second. The two parts are about equal in length in Perodicticus; but in all the rest of the order the first falls short of the second, especially in Indris, and immensely so, of course, in Galago and Tarsius.

The length of that part of the os calcis which is in front of the posterior articular surface for the astragalus falls very short of the antero-posterior diameter of that surface (less than half) in the Gorilla. It also falls short of it, though not to such an extent, in Man, the Chimpanzee, Simia, and Hylobates.

Of the other forms it about equals it in the Nycticebinæ; in the rest it exceeds it, greatly so in Indris, and immensely so in Galago and Tarsius.

The outer surface of the os calcis has generally one or two peroneal tubercles, but in the Gorilla *, and sometimes in the Chimpanzee, a very deep groove passes antero-posteriorly above one of them (Plate XIII. fig. 6).

The articular surfaces for the astragalus are generally more nearly equal in size in other Primates than in Man, and in the Lemuroidea the anterior one is often the larger. The posterior one is less convex, and the two are divided by a relatively wider groove in the lower Anthropoidea than in Man and the Gorilla.

The surface for the cuboides is generally much wider than the posterior articular surface for the astragalus; it is not so, however, in the Gorilla and Man, in which forms also it is less concave than in the others. It is very concave in the Nycticebinæ, Galago, and Tarsius.

Astragalus.—The head of the astragalus is generally united to the body of the bone by a tolerably long neck. This is very short, however, in Man, slightly more so in the Chimpanzee; and the bone has the minimum of length to breadth in the Gorilla † (Plate XIII. fig. 7). In other forms it is more elongated than in Man, and in the Orang it is exceedingly long ‡.

The upper surface is always more or less convex antero-posteriorly, and concave transversely. This convexity is generally more marked than in Man, but decidedly less so (than in him) in the Orang, and still less in Ateles and the Gorilla. This upper surface is almost always broader behind than in front; but the difference is very small in Man, and still less in Ateles, Simia, Hylobates, Lemur, and Loris.

When in Man, the astragalus is articulated with the os calcis, and the bones are placed in their natural position, with the long axis of the tuberosity of the os calcis vertical, then the upper surface is almost quite horizontal, and the lateral surfaces for the malleoli are vertical.

This condition is not so perfectly attained in any other form. In all other Primates,

* Noticed by Professor Owen (Comp. Anat. of Vetebrates, vol. ii. p. 550).

† Professor Owen remarks that it is broader in proportion to its length than in Man (Comp. Anat. of Vertebrates, vol. ii. p. 550).

‡ De Blainville speaks of its elongation in Cheirogaleus Milii as remarkable (*loc. cit.* Lemur, i. 12).

when the bones are naturally united, as when the tibia is vertical, then the long axis of the tuberosity of the os calcis inclines from below upwards and peronead, the outer surface of that bone tending towards the ground.

Now, with this bending downwards and inwards of the outer part of the os calcis, a concomitant upward development of the peroneal side of the astragalus often takes place, causing the surface for the outer malleolus to form an acute angle with the upper part of the astragalus. This is the case in Troglodytes, Simia, the lower Simiidæ, Cebus, and most of the inferior Cebidæ, and in Hapale and Tarsius. This angle, however, which is almost a right angle in Man, is nearly so in Hylobates and Pithecia, while in Ateles and Lagothrix it is obtuse, as also in the Lemuridæ, especially the Nycticebinæ, where it is so much so that the peroneal surface becomes not far from horizontal.

The angle formed with the top of the astragalus by the surface for the tibial malleolus is generally more or less obtuse, and most so in the Gorilla *, where it is almost on one plane with the upper surface (Plate XIII. fig. 7). In Man this is almost a right angle, and nearly so in Indris.

The peroneal surface generally looks more or less backwards, but not so in Man and Ateles, and scarcely so in Hylobates, Lagothrix, Tarsius, and Cheiromys.

The tibial malleolar surface is not generally so much smaller than the peroneal one, as in Man and the Gorilla; but, on the other hand, in the Nycticebinæ the predominance of the outer one is yet greater. In Ateles the equality of the two surfaces is remarkable.

When the bone is altogether detached and placed on a horizontal surface, the peroneal border of the upper surface, in Man and Ateles, is slightly below the tibial one, and this is still more the case in the Nycticebinæ, and sometimes in Lemur. In the Chimpanzee and Hylobates the peroneal border, when the bone is so placed, is slightly higher than the tibial one, and very much so in the Gorilla and the lower Simiidæ and Cebidæ.

The head of the astragalus is sometimes much compressed; this is the case in Ateles, but the compression is at its maximum in Loris.

The groove for the tendon of the *flexor longus hallucis* is sometimes marked off by a sharp process from that for the *flexor longus digitorum*. It is more or less so in Ateles, Lagothrix, Lemur, and Galago, but most so in the Nycticebinæ, where in Loris the tendon of the *flexor hallucis* is made to pass through almost a bony foramen by the large development of this process and the simultaneous intwisting of the tuberosity of the os calcis.

Of the inferior articular surfaces the anterior one is relatively smallest (compared with the posterior one) in Man and the Gorilla. It is rather larger in the Chimpanzee and Hylobates, still more so in the lower Simiidæ, and largest, relatively, in the Nycticebinæ, especially in Loris.

* Noticed by Professor Owen (Comp. Anat. of Vertebrates, vol. ii. p. 550).

The posterior inferior articular surface is always concave.

The anterior inferior articular surface is flat or more or less concave in Man and the Gorilla, generally it is slightly convex, and sometimes, as in Ateles and Loris, strongly so.

Naviculare.—This bone is always short disto-proximally in the Anthropoidea, longer in Indris and Microcebus *, but enormously long in Galago and Tarsius, especially the latter.

As compared with the os calcis, its length is also greatest in Galago and Tarsius, and its proportion in Microrhynchus greatly exceeds that in Indris or that in Lemur; in the Anthropoidea also it is relatively very short.

Its anterior and posterior faces are in Man nearly vertical and parallel. In all the other Anthropoidea the posterior face slopes more or less obliquely downwards, so that it looks somewhat upwards. In Lemur the two surfaces diverge as they descend from the dorsum, and they appear to do so generally in the other Lemuroidea, except in the Nycticebinæ, where they are again about parallel and nearly vertical.

The tuberosity of the naviculare is sometimes very large; it is so, and remarkably produced backwards, in Hylobates. It also extends much backwards in Ateles, Mycetes, and Cebus, but downwards in Lagothrix. This process in Man is generally † quite small.

The surfaces for the reception of the cuneiform bones are generally more convex and concave than in Man, but the convexity attains its relative maximum in Loris (Plate XIV. fig. 10), where two strongly projecting tubercles support the ento- and meso-cuneiform bones.

The naviculare almost always articulates distinctly with the cuboides; sometimes, however, only very slightly so.

Ento-cuneiforme.—The prevailing form of the internal cuneiform bone is antero-posteriorly short above, but longer towards the sole, *i. e.* its vertical extent is considerably greater at its distal than at its proximal end (Plate XIV. figs. 12 & 13).

Man, the Gorilla, and Orang differ from all other Primates in the more complete equality of the antero-posterior dimensions above and below, and of the vertical extent in front and behind (Plate XIV. fig. 11).

It is short antero-posteriorly as compared with its height in the Lemuroidea, especially in Indris, and most of all in the Nycticebinæ.

The outer surface is but slightly concave in Man, and some others, as Troglodytes and Ateles. It is more or less markedly concave in the lower Simiidæ.

The surface for the hallux has its long axis directed from the dorsum of the ento-cuneiforme towards the sole, and, except in Man, is always strongly convex.

* Proc. Zool. Soc. 1864, p. 624, fig. 1.

† In the skeleton of a giant, No. 5905 B, in the Museum of the Royal College of Surgeons, the tuberosity is very much produced, but not antero-posteriorly expanded. It is also rather produced in the skeleton of O'Byrne in the same Museum. Mr. Henry Hancock (lectures before referred to, 'Lancet' for June 16, 1866) calls attention to these instances.

The articular surface in Man looks more straight forwards than in the other forms, in which latter it is directed more tibiad, a condition which is very marked in Troglodytes.

The long axis of this articular surface always forms a more or less acute angle with a line drawn across the articulations of the four outer metatarsal bones where they join the proximal row of tarsals (Plate XIV. fig. 8).

In the lower Simiidæ this angle is quite as acute as in Man (Plate XIV. fig. 9), or even more so; and the same is the case in the Lemuroidea, but in Troglodytes the angle is a little more open, though nothing nearly so much so as is the homotypal angle in the human hand, nor even equalling that of the manus of the same species. The other Simiinæ * resemble Man and the lower Simiidæ in this respect.

The articular surface is sometimes (as in Hylobates, the lower Simiidæ, and to a certain extent in Man) notched on its peroneal side, but there is no concavity of the surface, making it a saddle joint, in any of the Anthropoidea, though I have observed a very slight depression towards the lower end of the cylinder in the Chimpanzee, Cebus, Mycetes, and Hapale. In the Lemuroidea, however, there is a true and decided saddle joint (Plate XIV. fig. 13), though the concavity is very slight in Indris, Galago, and Perodicticus, and all but obsolete in Nycticebus Javanicus.

The articular surface for the second metatarsal is almost always closely approximated to the surface destined for the hallux; in Simia, however, the two are widely separated†.

A strong tubercle or ridge sometimes projects from the middle of the inferior margin of the tibial surface, as in Ateles, Perodicticus, and Lemur.

Meso-cuneiforme.—This bone is sometimes very much vertically extended, as compared with its other dimensions, as in Man, Troglodytes, and the Nycticebinæ. Generally, perhaps, it is, as in Macacus, about as long as high. In Lemur the antero-posterior extent sometimes predominates.

The postero-inferior angle is sometimes produced into a sort of rounded head, as in the lower Simiidæ, and to a slight extent in the Nycticebinæ. In others, as Man, Troglodytes, Ateles, Lemur, this is not the case.

In some of the Lemuroidea (certainly in Lemur and Loris, and probably in Indris and Galago) it joins the cuboides beneath the ecto-cuneiforme. This is never the case in the Anthropoidea.

Ecto-cuneiforme.—The external cuneiform bone is sometimes much longer vertically than antero-posteriorly, as in Troglodytes and Simia. It is very slightly so in Hylobates. The two dimensions are about equal in Macacus, Ateles, Lagothrix, Mycetes, and Loris. In Man, the Pithecinæ, Nyctipithecus, and Chrysothrix and others, it is slightly longer than high, and twice as long as high in Lemur‡.

* Dr. Lucae remarks the difference between the Gorilla and Orang in this respect (*loc. cit.* p. 304. Tab. 3. fig. 6 *a*, *b*).

† Represented in Dr. Lucae's plate 3. figs. 5 & 6, and noticed by Professor Huxley (see 'Medical Times' for 1864, vol. i. p. 565).

‡ Well represented in Fischer's 'Anatomie der Maki,' Tab. 15. c. 9.

The proximal surface is sometimes convex, as in Macacus, Lemur, and others; sometimes, as in Man, it is nearly flat. The tibial surface has generally two facets, at its distal end, for the second metatarsal, as in Macacus, Lemur, and others. Sometimes there is only one such, as in Troglodytes and Ateles. The peroneal surface has generally two facets for the cuboides, as in Macacus, Lemur, Loris, and Troglodytes. In Ateles there is only one, which is at its upper anterior angle. In Man there is also only one, but it is posterior in position.

The vertical diameter of its distal articular surface is sometimes in excess, as in Man. Sometimes it is the transverse one which is so, as in Lemur and Loris. Sometimes, as in Macacus, the posterior inferior angle of the bone is produced into a rounded head, though this is not so marked as is that of the meso-cuneiforme. Sometimes, on the other hand, the posterior surface slopes rapidly downwards and forwards, as in Lemur and Hylobates.

The bone projects distally in Man considerably more than the cuboides or meso-cuneiforme do, and sometimes it does so in Ateles. It projects distally beyond the meso-cuneiforme in the Chimpanzee, Hylobates, Semnopithecus, Macacus, the Pithecinæ, the Nyctipithecinæ, Cebus, Hapale, Indris, Lemur, Loris, and Galago. Much so in Tarsius, slightly so in Cheiromys. Very slightly or not at all so in the Gorilla, and not at all in Simia and Ateles. Sometimes it projects distally beyond the cuboides, but not beyond the meso-cuneiforme, as in Lagothrix and Mycetes.

Cuboides.—The length of the cuboides, as compared with that of the os calcis, is greatest in Hylobates, where it sometimes attains one-half. In the rest it varies between this and Galago, where it scarcely exceeds a quarter, and is least of all in Tarsius, where it is less than one-tenth *.

The line of junction of this bone with the os calcis is generally anterior to that of the astragalus and naviculare. It is exceedingly so, of course, in Tarsius and Galago, and it is markedly so in all the Lemuroidea besides, though least so in the Nycticebinæ, especially in Perodicticus. It is also decidedly anterior in Nyctipithecus, Chrysothrix, and Pithecia. In other forms it is generally slightly so, except in Lagothrix and Mycetes, where the two lines of junction form but one, Ateles, where the junction of the naviculare with the astragalus may be anterior, and Man and Troglodytes, where the latter condition generally, if not always obtains.

The distal articular surface is sometimes almost flat or only slightly concave, as in Man; sometimes decidedly concave but concave only, as in Lemur, Loris, and the Cebidæ; sometimes concave above and decidedly convex below, as in the lower Simiidæ.

The posterior surface offers an inferior projection (generally rather, or quite on the tibial side of the bone), which varies in size with the corresponding concavity of the os calcis, being very prominent in Loris and Galago †.

* Owing, of course, to the abnormal length of the os calcis in Galago and Tarsius.

† See the woodcut and description of this joint in Galago Senegalensis, given by Dr. Lucae (*loc. cit.* p. 314).

The plantar surface always offers a ridge, bounding posteriorly a groove for the tendon of the *peroneus longus*.

As has been before said, according to Van Campen * there is in the Potto (Perodicticus) an extra bone situated in the transverse ligament enclosing the flexor tendons, and near the ento-cuneiforme. He has figured it below the detached tarsal bones, and it is marked +.

It is noteworthy that in the species possessing the peculiar ossicle, already described, in the manus, this homotypal exceptional structure should also be developed in the pes!

Metatarsus.

This segment attains its greatest absolute length in the second metatarsal bone of Simia.

The metatarsus, as estimated by a comparison of the length of the second metatarsal with that of the whole pes, is greatest in Hylobates †, where the first is about one-third of the second. In most it is above a quarter, but in the Nycticebinæ and Cheiromys it is between this and a fifth, while in Galago and Tarsius the proportion is still less. The proportion borne by the metatarsus to the pes is exceeded by that borne by the tarsus to the same, in none so much as in Man, except Tarsius and Galago, where the latter proportion is still greater. In the Gorilla, however, the excess comes very near to that existing in Man.

The metatarsus exceeds the tarsus in length in Simia, Hylobates, the Semnopithecinæ, Ateles, Pithecia, Chrysothrix, Hapale, and Indris. In the others the tarsus equals or exceeds the metatarsus, and largely exceeds it in Man and the Gorilla, and still more in Tarsius and Galago, where it is much more than twice the length of the metatarsus.

The proportion borne by the metatarsus to the spine is greatest in Tarsius, but it is very large also in Hapale and Cheiromys.

The four Outer Metatarsals.—These metatarsals are always more or less enlarged at each end. Almost always the proximal ends are wider transversely than are the heads (*i. e.* the distal ends) of these metatarsals. The disproportion in this respect is greatest in Man, though the lower Simiidæ approximate to him. In Simia, however, the heads are scarcely narrower than the proximal ends, and sometimes in the Nycticebinæ those of the third and fourth metatarsals are absolutely broader.

The proximal surfaces of these metatarsals, except that of the fifth metatarsal, are sometimes nearly at right angles to the long axes of their shafts, as is the case in the Simiinæ ‡, especially in Simia.

* Verhandelingen der Koninklijke Akademie van Wetenschappen. Zevende Deel, 1859, p. 21, & pl. 1. fig. 8†.

† From Dr. Lucae's measurements it appears that this proportion is sometimes greater in Simia than in Hylobates. Also that in Cynocephalus and Macacus the metatarsus is sometimes more than one-third of the length of the pes, and as 38·5 to 100 (see *loc. cit.* p. 317).

‡ See Dr. Lucae's figures, pl. 3. figs. 1, 2, 5, 10.

On the other hand, in Man *, the lower Simiidæ †, the Cebidæ, Hapale, and Lemur they are not so, but their bases are as it were bevelled off, so that a line drawn across the articulations of these outer metatarsal bones with the tarsus inclines proximally as it proceeds peronead from the index.

The head of each of these metatarsals has its vertical diameter always greatly in excess of its transverse one, but this excess is carried to its maximum, perhaps, in the Simiinæ (especially Hylobates) and Man.

The shafts (if taken from a short distance beyond the proximal ends to a similar distance from the heads) never broaden distally, but decidedly taper in the lower Simiidæ, and still more so in Man. In Troglodytes they taper slightly, and very slightly in the other forms, except in Simia, Hapale, and the Lemuroidea, where they cannot be said to do so at all.

The shafts are much laterally compressed in Man, the Simiinæ, and Ateles; in the rest they are more or less rounded.

Antero-posteriorly directed planes passing from the middle of the dorsum, of each of these metatarsals, to the most prominent parts of their plantar surfaces, never *con*verge below, in the Anthropoidea ‡, to the middle, or to the fourth metatarsal, but more generally *di*verge from the former. Such a plane in the second metatarsal (that of the index) generally inclines downwards and tibiad; and in the fourth and fifth metatarsals downwards and peronead. In Man this latter inclination is extreme, the fifth metatarsal being more flattened inferiorly in him than in any other Primate, though it is decidedly somewhat flattened below in many, *e. g.* in Hylobates and Ateles. In Lemur, Galago, and the Nycticebinæ this flattening is not at all marked, and in them perhaps even a certain convergence of these planes towards the middle metatarsal may be noted.

The under surfaces of the metatarsals are slightly, but never more than slightly, concave from before backwards; this is more marked, perhaps, in Troglodytes and Lemur than in others.

In Man, Hylobates, and the lowest Simiidæ these metatarsals are very nearly parallel; in the rest they diverge but very slightly from behind forwards, most so in the Lemuroidea.

The ends of the heads of these metatarsals are often inclined more or less strongly peronead, as compared with the long axes of their shafts. This is very marked in the lower Simiidæ and the Cebidæ, but little so in the Lemuroidea, and not at all, or only very slightly so, in Simia, Troglodytes, and Man.

These distal articular surfaces do not, in Man, bend downwards towards their ends, but continue almost on a level with the dorsum of the shafts; they are also limited

* Described by Professor Huxley in his 'Hunterian Lectures' (see 'Medical Times' for 1864, vol. i. p. 177).

† The obliquity of the metatarsals in Cynocephalus is well represented by Dr. Johan Georg Ilg, in his 'Monographie der Schneurollen.' Zweiter Abschnitt, Erste Abtheilung, fig. 2.

‡ De Blainville says of the metatarsals of Cercopithecus sabæus, they are arched, "le second en dedans et les trois autres en dehors" (*loc. cit.* p. 19).

posteriorly by a deeper transverse groove in him than in other forms. It must be admitted, however, that the Mandrill approaches Man very nearly in this.

As to the length of the metatarsals, compared with that of the metacarpals of the same individuals, and estimated by a comparison of those of the third digits of the manus and pes, the metatarsals are in excess in all Primates except the Simiinæ and Cheiromys; and such would also be the case in the last-mentioned genus but for its peculiarly elongated middle metacarpal. In Galago, Perodicticus, Arctocebus, and Tarsius the two segments are of very nearly the same length.

The breadth of the metatarsals, as compared with that of the metacarpals of the same individual, is always less * in Man and the Simiinæ, both absolutely and relatively to the length of the bones; in the latter respect it is also less in all the other genera of the order, except, perhaps, some of the Nycticebinæ and Tarsius.

First Metatarsal.—This bone attains its greatest absolute length in the Gorilla, if we except gigantic human forms.

As compared with the spine, this bone is longest in Tarsius, and then in Hylobates and Cheiromys, but it is as much as one-tenth the length of the spine in Indris and Ateles; in the rest it is less, and shortest in Hapale, Perodicticus, and Arctocebus, where it is little more than one-twentieth.

It is longer than the first metacarpal in every species except Simia, but in Perodicticus the excess is exceedingly small.

The proximal end has always an enlargement, for the tendon of the *peroneus longus* on the index side of its plantar surface. This process becomes extreme in size in the Lemuroidea, where it often comes in contact with the tibial side of the second metatarsal. There is a mere rudiment of this process in some, *e. g.* Ateles.

The proximal end also presents an articular surface elongated in the direction of the long axis of the corresponding articular surface of the ento-cuneiforme. This surface is sometimes slightly concave, as in Man, generally strongly so, as in most other forms; and in the Lemuroidea it is also somewhat convex in a direction at right angles to that of the concavity, corresponding to the saddle-shape of the articular surface of the ento-cuneiforme in them.

The long axis of this proximal articular surface of the first metatarsal very rarely (only in Man) runs almost vertically from the dorsal towards the plantar margin of the proximal end of the bone (Plate XIV. fig. 14). In the Simiinæ it runs obliquely from the peroneal side downwards and tibiad to the plantar and tibial angle of the proximal surface (Plate XIV. fig. 15); in all the lower forms it runs more transversely between the dorsal margin, which is turned more or less tibiad, and the peronead turned plantar margin of the same proximal surface (Plate XIV. figs. 16–18).

It is as if the metatarsal of Man had been removed, softened, and then, after being turned so that the dorsum looks tibiad as well as upwards, reapplied to the convex ento-

* Speaking of C. sabæus, De Blainville says, "Les os du métatarse sont surtout bien plus longs que ceux du métacarpe, un tiers en sus; ils sont en outre généralement plus grêles" (*loc. cit.* p. 19).

cuneiforme, and thus stamped with an oblique depression, or, if turned still further, with a transverse one.

The shaft of the bone is generally nearly straight, but in the Simiinæ it has a twist, which seems to disappear, or almost so, with the acquisition of a nearly transversely extended concavity in the articular surface. Thus in the Simiinæ the distal end of the bone can assume a position which would be impossible without this twist.

This distal end of the bone is rarely so large as the proximal one, and never predominates over it, as is the case with the homotypal parts in the pollex. The angle formed by an axis piercing it from side to side transversely, with another similarly traversing the heads of the other metatarsals *, is very rarely (only in Man) so extremely obtuse as to approach 180°.

In the Simiinæ, as well as in the lower forms, this angle is much more acute, approximating to 90°.

This metatarsal is the longest one of the whole pes in Galago and Arctocebus. It is shorter than the other metatarsals in all the other forms except Loris, Perodicticus, and Tarsius; though in Indris it is very little so.

Second Metatarsal.—This is sometimes the absolutely longest metatarsal of all, as has been said, but in a certain form (Arctocebus) it is the absolutely shortest of the order.

It is the longest of all in the same pes in Man, and (if we exclude the backwardly extending process of the base of the fifth metatarsal) also in the Simiinæ and Lemur, and at least sometimes in Ateles and Lagothrix.

It is the shortest metatarsal in Arctocebus, Perodicticus, and Tarsius; and it is the shortest except that of the hallux in the Semnopithecinæ, Pithecia, Nyctipithecinæ, Hapale, Indris, and Cheiromys.

It projects more forwards (*i. e.* distad) than the three metatarsals external to it in Man, the Simiinæ, Ateles, and Lagothrix.

It projects less than those do in Pithecia, Chrysothrix, Hapale, Indris, Tarsius, and Cheiromys.

It is longer than the second metacarpal in all except the Simiinæ, Tarsius, and Cheiromys.

The proximal end has an articular surface, which is flat, as in Man, or concavo-convex, as in the other Anthropoidea, or convex only, as in the Lemuroidea.

Sometimes (rarely), as *e. g.* in Lemur and Loris, it meets the proximal end of the fourth metatarsal beneath the ecto-cuneiforme.

The proximal end extends further back than the base of the third metatarsal. In Man, Troglodytes (only slightly so in the Gorilla), Hylobates, the lower Simiidæ, sometimes in Cebus, in Pithecia, Nyctipithecus, Hapale, in the Lemuroidea generally, and greatly so in Lemur.

Third Metatarsal.—This is absolutely longest in Simia.

* The plantar angulation of Professor Huxley.

It is the longest of all in the same pes in the lower Simiidæ, sometimes in Cebus, in Mycetes, Perodicticus, and Cheiromys.

It is never the shortest of the pes, but it is longer than the third metacarpal in all except the Simiinæ and Cheiromys, though it is almost the same length in Galago and Tarsius.

It projects most forwards, of the four outer metatarsals, in the lower Simiidæ, Cebus, Mycetes, the Nyctipithecinæ, and Lemuroidea.

The proximal articular surface is flat in Man, and more or less convex in the other forms.

Fourth Metatarsal.—This is the longest one of the pes in Pithecia, and the Nyctipithecinæ, Hapale, Indris, and Tarsius.

It is the shortest metatarsal in Loris and Galago.

It projects the most forwards of all the metatarsals in Pithecia and Hapale.

It is longer than the fourth metacarpal in all except the Simiinæ; but the length of these two bones is nearly the same in Galago and Arctocebus.

The proximal end is almost always strongly convex, except in Man.

Fifth Metatarsal.—When the backwardly-projecting process of its base is included, this metatarsal is the longest of the pes in the Gorilla, many Cebidæ, Cheiromys, and sometimes in Man.

Without including that process, it is the shortest of the four outer metatarsals in Man, the Simiinæ, Ateles, Lagothrix, Lemur, and Loris.

Except that of the hallux, it projects less forwards than any other of the metatarsals in Man, the Simiidæ, the Cebinæ, Mycetes, Nyctipithecus, Lemur, Galago, and Loris.

It is longer than the fifth metacarpal in all except the Chimpanzee, Simia, and Hylobates; but it is very little so in Arctocebus and Perodicticus, while in Brachyurus, Nyctipithecus, Chrysothrix, and Hapale it is more than double the length of the fifth metacarpal.

Its proximal end is in general strongly convex. A process projects backwards from the outside of the proximal end of the fifth metatarsal. This is at its maximum in Man and the Gorilla. It is smaller relatively, as well as absolutely, in most others, especially in the Lemuroidea.

Phalanges.

The hallux has always two phalanges, except, as is well known, in Simia, where there is often but one.

Each of the other digits has three distinct phalanges, except in Man, where generally the ultimate and penultimate phalanges of the fifth digit become anchylosed together.

The *proximal phalanx of the hallux* is absolutely greatest in Man, but the Gorilla approaches him *very* closely * in this respect.

* Professor Owen has found it to equal that of Man (Comp. Anat. of Vertebrates, vol. ii. p. 551).

It is decidedly longer than its homotype of the manus in Man, Troglodytes, the long-tailed Simiidæ, and Indris, being in Colobus nearly three times as long. The two segments are about equal in Cynocephalus, in the Cebidæ (except, of course, Ateles), in Lemur, Galago, Loris, Arctocebus, and Tarsius. On the other hand, it is decidedly shorter in Simia, Hylobates, Hapale, Perodicticus, and Cheiromys.

It is always shorter than the first metatarsal, but at the same time is more than half its length, except sometimes in Simia and Hylobates and the lower Simiidæ, especially Semnopithecus and Cynocephalus.

The *second phalanx* is more than half the length of the first, except in the Semnopithecinæ, sometimes in Macacus, in Nyctipithecus, Hapale, and Tarsius, in which last it is very short, as compared with the proximal phalanx.

It is always flattened from above downwards at its distal part.

The *phalanges of the other digits* are, except in Man, very similar to those of the manus, but, as in him, they are narrower transversely than their respective homotypes. This difference is less marked below the Simiidæ, yet always exists except in Tarsius, and sometimes, perhaps, in the Nycticebinæ.

They are convex above and flattened or concave below; but in Man the shafts are so short that the inferior flattening is inconspicuous.

The distal ends of the several joints are formed nearly as in Man, except as regards the distal ends of the ultimate phalanges of some.

These ultimate phalanges are always flattened distally, more or less, as in Man, except in Hapale, where they are laterally compressed, curved, and pointed, like those of the manus; in the index of the Lemuridæ, which is elongated and pointed at its end; in Cheiromys, where they are "subcompressed and acutely pointed"*; as also in Tarsius.

The *proximal phalanx* of either the second or the third digit is the longest phalanx of all the four outer digits of the same pes in the Anthropoidea. In the Lemuroidea that of the fourth digit is the longest.

The length of the phalanges may be perhaps best estimated by selecting those of the third digit.

The *proximal phlanx* of this digit is much less than half the length of the third metatarsal in Man; it is about half the length of the latter in the Simiidæ below the Simiinæ, and in Hapale.

It is a little longer than the third metatarsal in Galago and some of the Nycticebinæ.

No proximal phalanx of any of the four outer digits exceeds its supporting metatarsal in the Anthropoidea; but in Galago, the Nycticebinæ, Tarsius, and Cheiromys, that of the fourth digit exceeds in length the fourth metatarsal; and in Galago, Loris, and Perodicticus† the same may be said of the third digit.

The proximal phalanx of the third digit greatly falls short of the length of its homo-

* Owen, Trans. Zool. Soc. vol. v. p. 54.

† See Van Campen's figure, *loc. cit.*

type in Man; it falls less short in Troglodytes, Tarsius, and Cheiromys, and less still in Simia and Hylobates.

Often the two are nearly equal, and sometimes that of the pes is a little in excess. In Loris and Arctocebus it is considerably so.

The *second phalanx* is always more than half the length of the proximal phalanx, except in Tarsius, where it is a little less.

As compared with its homotype, it is less than half only in Man and Tarsius, but it is very little more than half in the Chimpanzee, and sometimes in Hylobates. It is still considerably shorter than its homotype in the Gorilla, Simia, Galago, and Cheiromys; in the rest there is but little difference, and the phalanx of the pes is sometimes a little the longer. In Indris, Loris, and Perodicticus it is decidedly so.

The *third phalanx*, as compared with the second one, is longest in Man, where it sometimes equals, and indeed even exceeds, the latter in length. It is often less than half the length of the second phalanx in other forms.

It is much shorter than its homotype, in Man and in all the Simiinæ. In the other forms there is no great difference, that of the pes being sometimes a little the shorter, sometimes, as in the Nycticebinæ, a little the longer.

The phalanges of the four outer digits shorten successively, except in Tarsius and sometimes in Galago, where the second phalanx of the fourth digit is as long as the proximal one of the index, and in the Nycticebinæ, where the latter is actually shorter.

Digits without their Metatarsals.

The *hallux* thus measured is absolutely longest in Man.

As compared with the length of the pes, it is longest by much in Arctocebus, and then in the Chimpanzee and Man, Indris, and Loris, in all of which its length equals, or is but very little less than a quarter of that of the pes.

Not counting Ateles, it exceeds its homotype most in Colobus. It falls slightly short of it in Lagothrix, Mycetes, Hapale, and Hylobates; more considerably so in Cheiromys, and most so in Simia. In all the rest it equals or slightly exceeds it.

It is the longest digit of the pes only in Man, and only sometimes in him.

It is the shortest one in all except Man, but only in the Semnopithecinæ, Lagothrix, Hapale, and Cheiromys is it so small as only to equal half the length of the fifth digit, except in Simia, where it is sometimes less than a quarter of the length of that digit.

The *index* is the longest of the pes only in Man, and only sometimes in him.

It is never the shortest digit, but it is the shortest one, except the hallux, sometimes in Hapale, and in all the Lemuroidea. In Man alone it projects the most. In Perodicticus and Arctocebus it is unusually short, being very little longer than the hallux in the latter genus.

The index is always shorter than the third digit, except in Man *.

As compared with the whole pes, the index is longest in Simia and Cheiromys (nearly two-fifths of the length of the latter), and scarcely less in Lagothrix and Mycetes. In the rest the proportion is less, being least but one in Man, and least of all in Tarsius, where it is less than a quarter of the length of the pes.

The *third digit*, as compared with the whole length of the pes, is longest in Loris, where it is more than half of the length of the latter, then in Cheiromys and Indris; and in all the rest it is much above a quarter, except in Tarsius, in which it is only slightly so, and Man, where it is less than a fifth.

As compared to its homotype, it is much shorter in Man, Simia, and Tarsius also, but to a less degree in Cheiromys, the Simiinæ, and others.

It is never the shortest digit of the pes, but it is the longest one in the Simiidæ, Cebinæ, and Mycetes. It projects most of the digits of the pes in the Simiidæ and most Cebidæ.

The *fourth digit* is the longest of the pes in Pithecia, sometimes in Nyctipithecus, and always in the Lemuroidea.

It is never the shortest one, even without the hallux. It projects the most of the digits of the pes in Pithecia, sometimes in Nyctipithecus, in Hapale, and in all the Lemuroidea.

The *fifth digit* is the longest one of the pes in none; it is the shortest one in Man, but in him only.

It is the shortest one, except the hallux, in the Simiidæ and Cebidæ, and it is about as short as the index in Hapale. The fifth digit projects more than the index in Pithecia, Hapale, and the Lemuroidea; not so in other forms.

The length of the longest digit, compared with that of the tarsus, is greatest in Loris, Arctocebus, Simia, and Indris (more than 160 to 100); it is least in Tarsius, Galago, and Man, in the last being only about half.

The proportion borne by the longest digit to the longest metatarsal is greatest in Arctocebus and Perodicticus, where the first is near being twice and a half the length of the second. In Galago and Lemur it is also more than twice its length. In the rest it is more than once and a fifth as long, except in Troglodytes, the lower Simiidæ, Chrysothrix, Hapale, and Man. In Man and some of the lower Simiidæ it is shorter than the metatarsal.

The relation between the proportion borne by the longest digit to the longest metatarsal, and that borne by the longest digit of the manus to the longest metacarpal, is so far uniform that, except in Perodicticus †, the first proportion is always smaller than the second. The difference between the two proportions, however, is almost nil in Simia,

* Dr. Lucae says that the index is longer than the third digit in Troglodytes (*loc. cit.* pp. 306, 307, and 320); also that in Cynocephalus mormon, the second and third digits are equal (*loc. cit.* p. 317). I am inclined to think that this variation may be owing to an error in mounting the specimens.

† As Perodicticus was the only exception I found, I was inclined to suspect that the specimen in the British

small in Indris, Arctocebus, and Loris. In most, however, it is smaller than in Man; but he is exceeded in this respect by Mycetes, Tarsius, Chrysothrix, Cheiromys, Nyctipithecus, and Hapale, in which the difference between the proportions becomes successively greater, the excess of the longest digit of the manus over the longest metacarpal being in the last-mentioned genus more than four-fifths greater than that of the longest digit of the pes over the longest metatarsal.

Digits with their Metatarsals.

The *hallux* thus estimated is absolutely longest in Man.

Its proportion to the spine is far greatest in Tarsius (more than a quarter), and then in Cheiromys and Hylobates, Indris, and Ateles, in all of which it is more than one-fifth the length of the spinal column. In Colobus and Hapale, on the other hand, it is but little more than one-tenth.

Its length, compared with that of the entire pes, is greatest in Arctocebus, Loris, and Indris, where it is more than one-half the length of the latter—a proportion it nearly attains in Man, and sometimes in Hylobates, while the Chimpanzee follows closely. In all the rest it is more than 33 to 100, except in Hapale and the Semnopithecinæ, where it is a little less, and Simia, where it is scarcely more than a quarter.

The hallux, when brought beside the index digit, attains to its extremity in Arctocebus; sometimes beyond its extremity in Man: to the middle of the distal phalanx, or rather beyond it, in the other Nycticebinæ, Galago, Tarsius, and sometimes in Man: to the middle or near the distal end of the second phalanx of the index in Lemur and Indris: to the proximal end of the second phalanx in the Chimpanzee and Cheiromys: to the distal end of the proximal phalanx in the Gorilla, sometimes Hylobates, Cynocephalus, Pithecia, and Nyctipithecus: to the middle, or nearly so, of the proximal phalanx in Hylobates (sometimes), the Cebinæ, Mycetes, Chrysothrix, and some lower Simiidæ: to a little beyond the base of the proximal phalanx in the Semnopithecinæ and Hapale: not nearly to the distal end of the metatarsal of the index in Simia.

The extent to which the hallux extends with regard to the index of the pes, when compared with the extent to which the pollex projects forwards beside the index of the manus in the same individual, is as follows:—

Almost always the hallux projects further than the pollex (omitting Arctocebus and Perodicticus).

The reverse condition, however, obtains largely in Hapale, in a less degree in some Cebidæ, *e. g.* Lagothrix, Mycetes, and also in Simia.

In most of the Cebidæ the relative extension is about equal; but in Man and Tarsius

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Museum had been wrongly articulated; but in Van Campen's memoir, before referred to, his plate represents the longest metacarpal as about equal to the longest metatarsal in length, while the longest digit of the pes decidedly exceeds that of the manus.

the difference is very great, and in this these two extreme forms agree together, and differ from all others.

The production of both, taken together, is greater in Loris than in Man and Tarsius, because, though the hallux projects a little less, the pollex projects so much more.

The combined projection is greatest of all in Arctocebus and Perodicticus, from the small development of the indices both of the pes and of the manus.

The hallux, when compared with the longest digit of the pes, is at its maximum in Man. Then follow Arctocebus, the Chimpanzee, and Indris, where the proportion is as about 7 to 10. In all the rest the proportion is greater than one-half, except in the Semnopithecinæ and in Simia.

The length of the hallux, as compared with that of the pollex, is, of course, far greatest in Ateles and Colobus, where the first is more than twice and a half the length of the second.

It always considerably exceeds the pollex in length, except in Hylobates, Tarsius, and Cheiromys, where it does so but little, and in Hapale and Simia, where it is absolutely less, the proportion in the last-named genus being as about 79·1 to 100.

The *index digit*, as compared with the spine, is longest in Simia, where it is nearly two-fifths of the length of the latter. It is only slightly less in Ateles, and but little so in Cheiromys and Tarsius. In all the rest it is less than in the last, but more than one-fifth of the length of the spine, except in Loris, Man, and Lemur, where it is a little less, and Perodicticus and Arctocebus, where it is little more than one-tenth.

The index of the pes is more than twice the length of its homotype in the manus in Arctocebus, and in Perodicticus it is more than once and a half as long.

It is longer than the index of the manus in all except Cheiromys, the Simiinæ, and Tarsius.

The *longest digit* of the pes (whether the third or the fourth), as compared with the longest one of the manus, is far greatest in Loris, where the first is nearly once and a half of the length of the second; but in all, except Man, the Simiinæ, Ateles, Tarsius, and Cheiromys, that of the pes is the longer. Of these last-mentioned genera the proportion borne by the digit of the pes is greatest in Ateles and Simia, least in Hylobates, where sometimes it is only as about 67·2 to 100.

Hand and Foot.

Dr. Lucae, after terminating his description of the variations of structure noticed by him in the extremities of the Primates, observes that a more minute examination of the pes of apes shows it to agree more with the human hand than with any other mammalian extremity, that its resemblances to the human foot are superficial, and that the use of the name Quadrumana is thus fully justified.

His words are, "Denn nicht nur eine genauere anatomische Untersuchung weist nach, dass die s. g. 'hintere Hand' sowohl anatomisch als auch physiologisch weit mehr

Uebereinstimmung mit der 'menschlichen Hand' als mit irgend einer terminaler Abtheilung der Extremitäten in der ganzen Säugethierreihe besitzt, und dass in der That nur mehr oberflächliche Formähnlichkeiten mit dem menschlichen Fusse vorkommen.—Die Ordnung der Quadrumanen ist daher eine vollkommen berechtigte" *.

The result of my examination, on the contrary, convinces me that the so-called "hinder hand," as well anatomically as physiologically, far more agrees with the human foot than with the human hand, and that it agrees with the latter only in more superficial points †. Also that the old term Primates is far preferable ‡ to the name Quadrumana, which is not applicable exclusively to Apes and Lemuroids, whatever definition be accepted of the term "hand."

If we accept as our definition of the word "foot," "*an extremity in which the hallux forms the fulcrum in standing or walking*" §, then Man alone has a pair of feet; and if at the same time we define the hand as an unguiculate extremity more or less prehensile, with four or five complete digits, the innermost of which may or may not be opposable, then unquestionably Apes and Lemuroids have no feet, but four hands, and no one *using such definitions* could be justly blamed for speaking of those animals as quadrumanous, though the epithet should then be extended to others which are very different.

But Dr. Lucae, without any such preliminary qualification, states broadly that both anatomically and physiologically the posterior extremity of Apes far more nearly resembles the human hand than the human foot.

He does so on the following grounds ‖ :—

1. The absence of the tarso-metatarsal arch in the foot of Apes, the inclined upper surface of the astragalus, and the support of the body by the anterior row of tarsal bones, the first and fifth metatarsals, and the toes, but not by the heel.

2. The short tarsus, no longer exceeding the metatarsus and toes; the greater rotation in the tarsal joint, and the hinge-joint formed by the metatarsals with the tarsus.

3. That the antero-posterior, dorso-plantar sections, "*sagittalen Durchschnitten*," are not parallel, but approximate to each other towards the sole. That all five metatarsals are not united together at their heads by ligaments, but only four of them, the fifth being free; also the form of these heads, which are but seldom, as in Man, provided with "*entwickelte Hemmungflächen*."

4. That the digits are long and mostly longer than the metatarsals; that the first toe is shorter than the second; that the second, however, is smaller than the third or even than the fourth.

* *Loc. cit.* p. 323.

† As justly observed by Professor Huxley (Man's Place in Nature, p. 91).

‡ It is not on anatomical grounds, however, that I would base my preference for the term Primates.

§ "The great toe, which forms the fulcrum in standing or walking, is perhaps the most characteristic peculiarity in the human structure; it is that modification which differentiates the foot from the hand, and gives the character to his order (*Bimana*)."—Owen on the Anatomy of Vertebrates, vol. ii. p. 553.

‖ Lucae, *loc. cit.* p. 321–323.

5. That not a dorsal, but a plantar flexion predominates in the tarso-metatarsal joint, and also * in the metatarso-phalangeal one.

6. Finally, on account of the mode of articulation of the hallux with the ento-cuneiforme.

Now, with regard to the plantar arch, it is, indeed, true that there is a certain difference between Man and Apes, owing to the hallux in the latter not being used as the fulcrum; but the tarsal bones, apart from the metatarsals, form in all the Anthropoidea an arch much as in Man, while in him, as in Apes, the fifth metatarsal takes no part in the arch, but is applied to the ground, as has been before noticed. The difference in this respect is small, indeed, between Man and the Gorilla as compared with that existing between the latter and other forms of the order, such as Tarsius, while the carpus of Man presents nothing at all resembling the antero-posterior arch of the tarsus of Apes.

The inclination of the upper surface of the astragalus very generally exists and has been described above, but it is difficult to see how this is any approximation to Man's hand.

As to the application of the heel to the ground, the difference is not between Man and the higher Apes, but between these and lower forms.

The shortness of the tarsus, as compared with the metatarsus, will not serve; for the proportion borne by the tarsus of the Gorilla to the metatarsus is overwhelmingly more like the proportion of the human foot than that of the homotypal parts of the human hand, the total length of the tarsus much exceeding that of the longest metatarsal, while in Galago and Tarsius the excess in length of the tarsus over the metatarsus is very far greater even than in the human structure. It is true that in none does the tarsus attain so great a length, as compared with the digits (whether with or without their metatarsals), as in Man, yet even in this respect the pes of the Gorilla and others far more nearly resembles the human foot than the human hand.

The rotation of the tarsal joint is certainly more extensive in Apes than in Man; but the shape of the joint closely resembles its homologue in Man's foot, and widely differs from his intercarpal articulation.

The convexity of the proximal articular surfaces of the metatarsals in the lower Apes does produce a sort of hinge-joint; but inasmuch as they *are* convex, they depart more from the structure of the proximal ends of the human metacarpals (some of which are more or less strongly *concave*) than from the flat proximal ends of the human metatarsals, while the highest Apes scarcely differ from Man in this respect.

As to the "sagittalen Durchschnitten," I must avow that I have been unable to find any indication of the plantar convergence of such in any Anthropoidea. There are differences indeed from Man's foot,—a lesser flattening beneath of the outermost metatarsals, and often a peronead bending of their distal ends,—but no approximation to the human hand.

The absence of a ligamentous connexion between the heads of the first and second

* P. 322, line 13 from the bottom.

metatarsals might be neglected in considering the *osteology* of the limbs; but it may be remarked that this absence is a necessary condition of the strongly prehensile action of the hallux; and that the hallux *has* such action in the Primates below Man is admitted by all. The difference presented amongst Apes as to the extent of connexion by soft structures, of continuous digits is not less remarkable.

As to the form of the heads of the metatarsals, the transverse grooves on the dorsum, and the projecting tubercles beneath, are but little less marked in some Cynocephali than in Man; and in such the pes far more resembles, in this respect also, the human foot than the human hand.

In the length of the digits, as compared with the metatarsals, in the predominance of the third digit in so many forms, and in the greater plantar flexion of the tarso-metatarsal and metacarpo-phalangeal joints, the pes of Apes does rather resemble the hand of Man than his foot; but the elongation of the digits in the pes of Apes is a point conceded by all disputants.

The convexity of the distal articular surface of the ento-cuneiforme is again a point of resemblance to the hand of Man; but, as has been before said in describing that part, the angle formed by the long axis of that surface with a line traversing the distal surface of the other tarsals more resembles that of the human foot than the homotypal angle of Man's hand (Plate XIV. figs. 6–9); and in general form and proportion the ento-cuneiforme of the Gorilla is overwhelmingly more like its human homologue than it is like the trapezium of Man (Plate XIV. fig. 11).

But, in addition to these points, it should be borne in mind that the pes of the rest of the Primates resembles the foot of Man, in that—

1. Except in the Chimpanzee, Cheiromys, and Hylobates, it always exceeds in length the manus of the same individual.

2. Consequently with the same exceptions, the proportion borne by the pes to the spine exceeds that borne by the manus.

3. The proportion borne by the length of the tarsus to that of the spine always greatly exceeds that of the carpus.

4. The whole of the tarsal bones, in number, form, proportion, and connexions, resemble the human ones infinitely more than they do the carpals of Man.

5. The tarsus directly joins both the long bones of the middle segment of the limb, not only one, as in the human hand.

6. The articulation with the leg, however oblique, is on the type of the human foot, and not on that of the human hand and arm.

7. Very generally the ecto-cuneiforme projects distally considerably beyond the meso-cuneiforme.

8. The cuboides has a transverse ridge and no process like the unciforme, and it has a more or less sharply-marked prominence behind.

9. The tarsus sometimes exceeds the metatarsus in length.

10. If the line joining the bases of the metatarsals forms an angle with the long

axis of the pes (through their proximal ends being bevelled off), it inclines outwards and backwards, as in the human foot.

11. The shafts of the four outer metatarsals do not become broader distally, but almost, if not quite, always taper somewhat from near the base to near the head of each.

12. Planes antero-posteriorly directed and drawn from the middle of the dorsum of each metatarsal to the most prominent part of its plantar surface do *not* converge at least in any Anthropoidea.

13. Sometimes strongly marked transverse dorsal grooves limit proximally the articular surfaces of the distal ends of the metatarsals.

14. The third metatarsal (except in Simia and Cheiromys) always exceeds in length the third metacarpal of the same species.

15. Except perhaps in some Lemuroids, the metatarsals are more slender than are the metacarpals in the same individual.

16. There is a prominence at the proximal end of the plantar surface of the innermost metatarsal.

17. There is a large process projecting backwards in some from the proximal end of the fifth metatarsal.

18. The length of the hallux with its metatarsal always exceeds the pollex with its metacarpal, except in Simia, Hylobates, Hapale, Tarsius, and Cheiromys.

19. The hallux extends further, in relation to the index of the pes, than does the pollex in relation to the index of the manus, in the great majority of forms.

20. Except in Perodicticus, the proportion of the longest digit of the pes to the longest metatarsal is always less than that borne by the longest digit of the manus to the longest metacarpal.

21. The phalanges of the pes are generally more slender than are the homotypal ones of the manus in the same individual.

The pes of Apes and Lemuroids differs from the foot of Man and resembles his hand, in that—

1. The proportion borne by the pes to the rest of the pelvic limb almost always exceeds that borne by the manus to the rest of the pectoral one.

2. The proportion borne by the pes to the tibia is generally greater than that borne by the manus to the radius, reversing the conditions existing in Man.

3. The innermost digit is supported on a strongly convex surface.

4. The innermost digit diverges from the others, and the transverse axis of its head forms an angle which approaches 90°, with a line joining the heads of the other metatarsals.

5. The metatarsus in many exceeds the tarsus in length.

6. The phalanges, and therefore the four outer digits, are of such length as compared with their metatarsals and with the hallux.

7. Neither the first nor the second digit is ever the longest one of the pes.

8. There is such an amount of plantar flexion on the joints.

9. The dorsal grooves limiting the articular heads proximally are generally less marked.

The manus in Apes and Lemuroids agrees with the hand of Man and differs from his foot, in that—

1. The length of the manus is almost always less than that of the pes in the same individual.

2. The length of the manus, compared with that of the spine, is almost always less than that borne by the pes to the spine in the same individual.

3. The length of the carpus, as compared with that of the spine, manus, and digits, is smaller than that of the tarsus, as compared with the spine, pes, and digits, in the same individual.

4. The form, arrangement, and connexions of the bones are similar.

5. At least two bones of the manus articulate with the long bones of the limb.

6. There is a convex cylinder supporting the innermost digit, and its long axis forms an obtuse angle with a line joining the proximal ends of the metacarpals.

7. The cuboides has an unciform process and no transverse groove.

8. The line joining the proximal ends of the metacarpals never inclines outwards and backwards.

9. The metacarpals expand distally.

10. The antero-posteriorly directed planes, traversing the metacarpals from the dorsum to the palm, converge palmad.

11. The metacarpals are broader than the metatarsals of the same individual.

12. The pollex with its metacarpal is almost always shorter than the hallux with its metatarsal, in the same individual.

13. The pollex generally extends less far forwards with relation to the index of the manus, than does the hallux with relation to the index of the pes.

14. Except in Perodicticus, the proportion of the longest digit to the longest metacarpal always exceeds that of the longest digit of the pes to the longest metatarsal.

15. The phalanges of the manus are broader than their homotypes of the pes in the same individual.

16. The angle formed by the transverse diameter of the head of the pollex with a line connecting the heads of the other metacarpals is similar to the homologous angle in Homo.

17. Neither the first nor the second digit is the longest one.

18. The lengths of the phalanges, and hence of the digits, are similar.

The manus of Apes and Lemuroids differs from the hand of Man and resembles his foot, in that—

1. The proportion, as to length, borne by the manus to the rest of the pectoral limb almost always falls short of that borne by the pes to the rest of the pelvic one, reversing the conditions in Man.

2. The proportion borne by the manus to the radius is generally less than that borne by the pes to the tibia.

3. There is a strong dorsal flexion of the metacarpo-phalangeal joints.

4. The fifth metacarpal has sometimes a well-developed process extending backwards from the outside of its proximal end.

5. Generally there is no saddle-shaped surface to support the innermost metacarpal.

6. Almost always the carpus is directly connected with both the lower long bones of the limb.

A consideration of all the points above enumerated can, I think, leave little doubt on an unprejudiced mind that, as regards the form and relative size of the bones, their juxtaposition, connexions, and modes of union,—in other words, as far as osteological *anatomy* goes *, the posterior extremity of Apes much more resembles the foot of Man than it does his hand; while at the same time the manus of Apes differs widely from Man's foot, and closely resembles his hand.

The prolongation of the controversy, the last word of which, till now, has come from Dr. Lucae, is, I think, owing to the dispute being one rather about words than about material objects; and it is perhaps well further to consider the meanings given to the terms "hand" and "foot" respectively.

The popular use of the word "foot" shows that its connotation is "support." We speak of the foot of Man, the fore and hind foot of a horse, the foot of a wineglass or of a mountain; and in this sense the term is applicable both to the fore and hind extremities of most Apes and Lemuroids, which are thus, as they are often called, "Quadrupeds." If, neglecting common usage, we frame a special definition, then, as has been seen, one can readily be devised applicable exclusively to the lower extremities of Man.

As to the word "hand," the signification given to it by popular use is vague enough; but precise definitions of the term have been framed by Cuvier, Isidore Geoffroy St. Hilaire, and others; it remains to see if one has been devised which will justify the application of the term "quadrumanous" to all Primates besides Man, and to them exclusively.

Cuvier's definition, "*le pouce libre et opposable aux autres doigts, qui sont longs et flexibles*," which has been accepted by so many, cannot be applied to the anterior extremities of Colobus, Ateles, and Hapale, and scarcely, indeed, to any of the Cebidæ †.

* For an excellent summary of the myological resemblances and differences of the extremities, which lead to the same result, see the report of Professor Huxley's Hunterian Lectures in the 'Medical Times' for 1864, vol. i. p. 457. See also the article by Ludwig Fick in Muller's 'Archiv,' 1857, p. 435.

† The imperfect opposition of the thumb in the Cebidæ was first, I believe, pointed out by Don Felix d'Azara in his 'Essais sur l'Histoire Naturelle des Quadrupèdes de la Province du Paraguay,' 1801, vol. ii. pp. 213, 233, & 244; also by Geoffroy, 'Dictionnaire Classique d'Hist Nat.' t. xv. 1829. Again, and independently, by Mr. Ogilby in the Penny Cyclopædia, vol. i. p. 442; and again by the latter gentleman in a paper published in the Proceedings of the Zoological Society for 1836, p. 25. Mr. W. Martin notices the same point, 'Nat. Hist. of Man and Monkeys,' 1840, p. 341. More recently, this incomplete opposability has been noticed by Professor Huxley in his 'Evidence as to Man's Place in Nature,' 1863, p. 93; and in his Hunterian Lectures reported in the 'Medical Times' for 1864, vol. ii. p. 93. The only partial opposition of the pollex in Hapale and Cebus is mentioned by Professor Owen, 'Comp. Anat. of Vertebrates,' vol. ii. p. 543; and Trans. Zool. Soc. vol. v. p. 274. Also by Vrolik, Todd's Cyclop. vol. iv. p. 213.

If we extend this definition so as to include those forms and to be applicable at the same time to the pes of all Primates except Man, and therefore call every prehensile extremity with four or five unguiculate digits, with or without an opposable innermost one, "a hand," the same term must then be applied to the pes of the Bat and of the Parrot; nor could it be consistently refused even to the extremity of the Sloth; while some Marsupials, and even the Chameleon, might successfully lay claim to the epithet "quadrumanous."

M. Isidore Geoffroy St. Hilaire gave a definition of the word in some respects better: "*Toute extrémité pourvue de doigts allongés profondément divisés, très-mobiles très-flexibles et par conséquent susceptibles de saisir entre eux et la paume les objets placés à leur portée*" *. But even this is not exclusively applicable to Apes and Lemuroids, especially if the pedal digits of the Gorilla and Siamang are to be spoken of as "*profondément divisés.*"

But it is not only on account of form and structure that the same term cannot be applied with propriety to the hand of Man and the pes of Apes; for the careful consideration of the *function* of the parts shows more difference between them than is often supposed, as well as a greater agreement between the pelvic extremity of Man and that of the other genera of the order. All admit that the hand of Man is almost exclusively prehensile, his foot almost exclusively locomotive; and it is commonly asserted that in Apes and Lemuroids the pes resembles the hand of Man in function far more than it does his foot. I believe, however, that this is not the case; for, in the first place, the foot of Man is not quite destitute of prehensile action, as Ludwig Fick † has noticed. In his excellent article on the hand and foot, that author truly observes that in locomotion, especially on an uneven surface, there is a certain abduction and adduction of the digits in the human foot. Professor Huxley has also called attention to its occasional grasping action ‡. In the second place, though this prehension is very much more developed in all the other Primates than in Man, yet in them this prehension is like that which exists rudimentarily in the human foot and not that of the hand of Man. It is a prehension *subsidiary to locomotion*, and a modification of the action of the pes in harmony with the form of the most frequent supporting surfaces (the boughs and twigs of trees), not a true assumption of the function of a hand which is still preserved by the anterior extremity. This view, that the prehension of the pes is a locomotive and not a manual prehension, is confirmed by some observations kindly communicated to me by Mr. A. D. Bartlett, Superintendent of the Gardens of the Zoological Society, to whom we are indebted for so much interesting information respecting the habits of animals. He informs me that he is confident that Apes and Lemurs do not use the pes as a hand, that is, for conveying food to the mouth, &c., unless the anterior extremities are already occupied; and this is the more remarkable, because he has

* Archives du Muséum d'Histoire Naturelle, 1839, p. 17.

† "Hand und Fuss," Müller's Archiv, 1857, p. 456.

‡ Man's Place in Nature, p. 86.

observed the spider-monkeys successfully employ their long prehensile tails to obtain an object otherwise out of their reach. He has also noticed that the flying fox, Pteropus (to the pes of which no one has applied, as far as I am aware, the term "hand"), will hold its food in, and eat from, its pelvic extremity.

As to the constant elevation of the heel above the ground spoken of by Dr. Lucae, it has been already observed that, at least in the higher forms (Simiinæ), this is not the case, especially, perhaps, in the Gibbons, where, in terrestrial progression, the pectoral extremities are raised entirely from the ground.

Thus, physiologically as well as anatomically, the same term may certainly be applied to the pelvic extremities of both Man and Apes.

Some, however, while denying that the term "hand" is applicable to the pes of Apes, go yet further and refuse to apply it even to the manus of those animals. Burdach observes * that the term "hand" applies truly neither to the anterior nor to the posterior extremity of Apes; and just as the word "foot" may be so defined as to apply exclusively to the pes of Man, so, no doubt, it might be possible to frame such a definition of the word "hand" as that it should be applicable only to the human manus.

Every one knows that the hand of Man possesses a perfection of structure such as exists in the extremity of no other animal; but this perfection consists in a number of minute points and delicate distinctions; and in descending the order Primates we are led by small steps from this highly finished structure to the comparatively imperfect manus of Ateles or Hapale. Indeed the difference is small, both anatomically and physiologically, between Man and the highest Apes, as compared with that existing between the latter and lower forms; and it is with perfect justice that Professor Huxley remarks †, in speaking of the manus of the Marmoset, "There can be no doubt but that the hand is more different from that of the Gorilla than the Gorilla's hand is from Man's." If, therefore, the same term is to be applied to the manus of all Apes and Lemuroids, it is difficult to see how the hand of Man can reasonably be excluded.

Thus, then, anatomically the pes of Apes agrees in a far greater number of points with the foot of Man than with his hand, and similarly the Simian manus resembles his hand and differs from his foot. At the same time there is a similar physiological resemblance, as the manus throughout remains *the* prehensile organ, while the predominant function of the pes is constantly *locomotion*. Although, therefore, to avoid ambiguity, it would be well in scientific treatises to avoid entirely these disputed designations, and to employ instead well-defined and unmistakeable homological terms, such as "pes" and "manus;" yet, if the former *are* used, the conclusion appears to me irresistible, that of Apes and Lemuroids (as well as of Man) it must be said that each and all they are severally provided with "TWO HANDS AND A PAIR OF FEET."

* Beiträge zur vergleichenden Anatomie der Affen, last page.

† Man's Place in Nature, p. 93.

DIMENSIONS AND PROPORTIONS.

The skeletons which have been measured for comparison are the following:—For Man, the skeleton No. 5569 in the Museum of the Royal College of Surgeons; for the Gorilla, No. 5178; Chimpanzee, No. 5082; Orang, No. 5050; Hylobates, Nos. 5026 and 5027; Colobus, No. 5008 A; and Semnopithecus, No. 5504,—all in the same collection. For Cercopithecus, a skeleton in my own collection; for Macacus, No. 4991 in the Museum of the Royal College of Surgeons; Cynocephalus, Nos. 4719 and 4720; Ateles, No. 4687; Lagothrix, No. A 4718 a; Cebus, No. 4671; Mycetes, No. 4718 b; and Pithecia, No. A 4670,—all in the same collection. For Brachyurus, No. 806 b; and for Callithrix, No. 969 a,—both in the Osteological Collection of the British Museum. For Chrysothrix, No. 4667, in the College of Surgeons Museum; for Nyctipithecus, No. 4665 A; Hapale, No. 4664 A; Indris, No. 4631; Lemur, No. 4661 A; Loris, No. 4633; Nycticebus, No. 4634 A; and Arctocebus, No. A 4632 a,—all in the same collection. For Perodicticus I have used the skeleton No. 743 c in the British Museum; and for Galago, No. 68 d, and Tarsius, No. 318 b, both in the same collection. Finally, for Cheiromys I have employed the skeleton in the Museum of the Royal College of Surgeons.

In estimating proportions, I have in general only employed one specimen of each genus; and therefore, as there is considerable individual variation, the proportions here given are offered merely as approximations to the true standard of each genus.

An average *, drawn from the comparison of a considerable number of specimens in each case, would have been more satisfactory; but, in the first place, materials for such an estimate are not as yet accessible, and in the second, even were they so, the expenditure of time would have been out of proportion to the result. I venture to think, therefore, that it may be left to such succeeding observers as may confine themselves to special groups, to rectify the results here given.

Following the happy idea started by Professor Huxley †, I have taken as my main standard of comparison (in estimating proportions) the vertebral column, estimating it by measuring it along its inferior (in Man anterior) curvature from the anterior (in Man upper) end of the atlas to the posterior (in Man lower) end of the sacrum.

The other dimensions given in the following Tables have been estimated as follows:—

The entire pectoral is measured from the summit of the head of the humerus to the distal end of the longest digit, whichever that may be.

* Such as is given by Mr. George Busk in his admirable paper "On the Cranial and Dental Characters of the existing Species of *Hyæna*," Journal of the Linnean Society, vol. ix. p. 59, 1866.

† Man's Place in Nature, p. 71. Dr. Lucae has not, unfortunately, pursued this plan, but in Man and the higher Apes he has estimated the spinal column by measuring from the atlas to the end of the coccyx, while in the lower forms he has measured to the end of the last caudal vertebra provided with a complete neural arch (*loc. cit.* p. 285). This divergence of mode necessitates a certain discrepancy between my results and those of Dr. Lucae, nevertheless a considerable correspondence exists between them.

The pectoral limb, minus the manus, is measured from the same point above to the anterior margin of the distal articular surface of the fore-arm.

The length of the scapula is estimated by a line drawn from the anterior (in Man superior) margin of the glenoid surface to the posterior (in Man inferior) vertebral angle.

The Humerus is measured from the summit of its head to the distal end of the ulnar (or inner) margin of the trochlea.

The Radius is measured from its head to the end of the styloid process.

The Ulna, from the end of the olecranon to that of the styloid process.

The Manus is measured from the distal margin of the radius to the extremity of the longest digit.

The length of the Carpus is estimated by a line drawn from the summit of the semilunare to the distal end of the magnum.

The length of the phalanges of the pollex, hallux, and third digits are given, as seen in skeletons, with the bones articulated together.

The Pelvic limb is measured from the summit of the head of the femur to the distal end of the longest digit, the pes being articulated, and the posterior part of the tarsus, of course, not counted.

The same, minus the pes, to the margin of the inferior surface of the shaft of the tibia.

The length of the os innominatum has been estimated by a line extending from the highest point of the crest of the ilium to the lowest one of the tuberosity of the ischium.

The conjugate diameter of the pelvis is measured from the anterior end of the symphysis pubis to the posterior (in Man inferior) margin of the first sacral vertebra.

Its transverse diameter is measured (wherever the brim of the true pelvis appears widest) in a line at right angles to the long axis of the trunk.

Its oblique diameter is estimated by a line extending from the ilio-pectineal eminence to the summit of the sacro-iliac synchondrosis of the opposite side.

The ilio-ischial angle No. I. is that formed by the superior (in Man posterior) margin of the ischium with the ilio-pectineal line.

The ilio-ischial angle No. II. is the one made by the same with the upper (in Man posterior) margin of the ilium.

The length of the femur is taken by measuring from its highest to its lowest extremity.

The tibia is measured to the lower end of the internal malleolus.

The length of the pes is taken from the distance between the end of the tuberosity of the os calcis and that of the longest digit.

That of the tarsus, from the posterior end of the os calcis to the distal margin of the ecto-cuneiform *.

* Dr. Lucae measures this segment only from the front of the articular surface for the tibia; hence there must necessarily be discrepancies between his estimates and mine.

LENGTH AND PROPORTION OF PECTORAL LIMB WITH AND WITHOUT THE MANUS.

	Length from atlas to caudal end of sacrum.	Length of entire pectoral limb.	Pectoral limb —manus.	Spine : 100 :: entire pectoral limb :	Spine : 100 :: pectoral limb —manus :
	inches.	inches.	inches.		
Man	28·5	30·50	23·00	107·3	80·7
T. Gorilla	27·0	40·75	31·00	150·9	114·8
T. niger	22·0	31·25	22·00	142·0	100·0
Simia	21·5	36·70	26·70	170·6	124·1
Hylobates, 27	12·3	25·00	19·10	203·2	155·2
Hylobates, 26	10·9	24·20	18·20	222·0	166·9
Colobus	18·7	17·15	12·15	91·7	64·9
Semnopithecus	16·0	16·50	12·20	103·1	76·2
Cercopithecus	12·5	11·90	9·00	95·2	72·0
Macacus	12·8	14·80	11·20	115·6	87·5
Cynocephalus, 19	21·3	25·85	19·75	121·3	92·7
Cynocephalus, 20	20·6	22·10	16·70	107·2	81·0
Ateles	12·7	22·20	16·20	174·8	127·5
Lagothrix	13·2	16·80	12·50	127·2	94·6
Cebus	10·3	11·30	8·30	109·7	80·5
Mycetes	14·7	15·45	11·10	105·1	75·5
Pithecia	8·5	8·60	6·20	101·1	72·9
Brachyurus	9·7	10·40	7·25	107·2	74·7
Nyctipithecus	8·0	6·90	4·70	86·2	58·7
Callithrix	10·5	?	6·40	?	60·9
Chrysothrix	8·7	7·20	5·40	82·7	62·0
Hapale	6·0	5·00	3·50	83·3	58·3
Indris	18·0	16·55	11·25	91·9	62·5
Lemur	14·8	11·30	8·10	76·3	54·7
Galago	5·1	4·40	2·89	86·2	56·6
Loris	5·7	5·85	4·65	102·6	81·5
Nycticebus	6·7	?	?	?	?
Perodicticus	10·2	8·15	5·75	79·9	56·3
Arctocebus	6·9	5·20	3·90	75·3	56·5
Tarsius	3·1	5·80	4·00	187·1	129·0
Cheiromys	7·4	9·50	5·25	128·3	70·9

DIMENSIONS OF SCAPULA.

Scapula of	Length from anteriorend of glenoid surface to posterior vertebralangle.	Length of axillary margin.	Vertebral margin following curves.	Vertebral margin behind spine.	Vertebral margin measured by a straight line.	From margin of glenoid surface to vertebral end of spine.	Length of glenoid surface.	Breadth of glenoid surface.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
Man	6·5	5·3	7·4	4·10	6·6	4·3	1·5	1·1
T. Gorilla	9·6	8·5	11·9	6·2	10·0	6·7	1·9	1·3
T. niger	6·6	5·9	6·0	3·3	6·4	5·0	1·3	·9
Simia	7·0	6·4	5·6	4·5	5·6	3·9	1·6	1·0
Hylobates	3·2	3·1	2·6	1·15	2·5	2·4	..	..
Hylobates	3·05	2·8	..	·95	2·0	2·4	..	..
Colobus	3·7	3·3	3·7	2·1	3·0	2·7	·7	·4
Semnopithecus	3·2	2·6	3·2	1·8	2·4	2·6	..	..
Cercopithecus	2·9	2·5	2·1	1·45	1·9	2·4	4·8	3·4
Macacus	3·4	3·0	2·5	1·6	2·0	2·9	·8	·6
Cynocephalus	5·2	4·4	4·3	2·7	3·5	4·5	..	..
Cynocephalus	4·6	3·8	4·5	3·0	3·7	4·2	..	..
Ateles	3·3	3·0	3·1	1·6	2·8	2·1	·6	·45
Lagothrix	3·0	2·7	2·7	1·5	2·4	2·4	·6	·4
Cebus	2·4	2·2	2·1	1·2	1·6	1·9	·5	·3
Mycetes	3·4	3·0	3·1	1·8	2·9	2·4	·6	·4
Pithecia	1·6	1·4	..	1·0	1·3	1·2	·3	·2
Brachyurus	2·0	1·8	..	1·2	1·4	1·5	·4	·23
Nyctipithecus	1·35	1·2	..	·65	·8	1·0	..	..
Callithrix	1·85	1·7	..	1·1	1·4	1·4	..	..
Chrysothrix	1·7	1·5	..	·9	1·1	1·3	·35	·20
Hapale	1·25	1·1	·90	·65	·8	·9	..	..
Indris	3·1	2·8	2·3	1·4	2·0	2·2	·6	·3
Lemur	2·5	2·3	1·2	·8	1·2	2·1	·55	·3
Galago	1·1	1·0	..	·35	·5	·9	..	..
Loris	1·0	·9	..	·55	·7	·8	..	..
Nycticebus	1·5	1·2	1·5	·95	1·2	1·1	·4	·2
Perodicticus	1·6	1·2	1·8	1·15	1·5	1·2	·45	·23
Arctocebus	1·1	·9	1·05	·6	·95	·85	·25	·15
Tarsius	·85	·80	..	·3	·35	·75	..	..
Cheiromys	1·4	1·3	·80	·6	·78	1·2	·3	·2

DIMENSIONS AND PROPORTIONS OF SCAPULA.

Scapula of	Length of anterior margin.	Spine : 100 :: length of scapula : ?	Axillary margin : 100 :: vertebral margin :	Axillary margin : 100 :: anterior margin :	Posterior vertebral angle.	Angle of glenoid surface with spine.	Angle of glenoid surface with axillary margin.	Angle of spine with vertebral margin.	Angle of spine with axillary margin.
	inches.				°	°	°	°	°
Man	3·4	22·8	124·5	64·1	40	80	135	95	55
T. Gorilla	4·3	35·5	117·6	50·5	34	90	120	110	30
T. niger	2·4	30·0	108·4	40·6	22	95	125	125 135	20 24
Simia	3·2	31·4	87·5	50·0	35	80	110 118	104	41
Hylobates	1·75	26·0	(86·8)	..	30 35	96	105	125	15
Hylobates	1·6	27·9	71·4	57·1	25	92	93	115	12
Colobus	2·48	19·8	90·9	..	50	95	132	100	40
Semnopitheeus	1·95	..	..	..	50	102	145	80 85	32 45
Cercopitheeus	2·18	23·2	76·0	87·2	50	97	130	97	34
Macacus	2·7	21·0	66·6	90·0	60	95	135 140	90	30 37
Cynocephalus	4·3	..	..	..	63	95	..	..	..
Cynocephalus	3·7	24·4	92·3	107·6	75	93	130	74 86	38
Ateles	1·3	25·9	93·1	48·2	30	95	110	127	20 25
Lagothrix	1·9	22·7	88·8	70·3	50	94	130	95	35
Cebus	1·5	23·3	72·7	68·1	45	85 95	130	103	30
Mycetes	2·0	23·1	96·6	66·6	48	85 95	123 115	95	40
Pithecia	1·0	18·8	92·8	71·4	45	80	120	95	45
Brachyurus	1·3	20·6	77·7	72·2	48	80 90	125	100	37
Nyctipitheeus	·9	16·8	66·6	75·0	42	95	130	112	28
Callithrix	1·2	17·6	82·3	70·5	40	94	135	110	35
Chrysothrix	1·2	19·5	73·3	80·0	47	93	130	90	34
Hapale	·8	20·8	72·7	72·7	45	97	130	100	25
Indris	1·8	17·2	71·4	64·2	45	110	130	115	28
Lemur	1·9	16·9	52·1	82·6	48	110	126	120	20
Galago	·8	21·5	50·0	80·0	50	105	128	120	17
Loris	·7	17·5	77·7	77·7	49	92	130	112	37
Nycticebus	·9	22·3	100·0	75·0	43	90	130	110	42
Perodicticus	1·1	15·6	125·0	91·6	55	98	145	95	42
Arctocebus	·7	15·9	105·5	77·7	35	110	142	110	30
Tarsius	·75	27·4	43·7	87·5	65	97	120	95	24
Cheiromys	1·1	18·9	60·0	84·6	65	112	132	95	20

DIMENSIONS AND PROPORTIONS OF CLAVICLE.

Clavicle of	Length following curves.	Length measured by a straight line.	Breadth at middle.	Spine : 100 :: length of clavicle :	Length of scapula : 100 :: that of clavicle :	Length of clavicle : 100 :: its breadth :
	inches.	inches.	inches.			
Man	6·8	6·0	·50	21·0	92·3	8·3
T. Gorilla	6·0	5·9	·60	21·8	61·4	10·1
T. niger	5·0	4·9	·50	22·2	74·2	10·2
Simia	6·8	6·5	·50	28·0	95·9	7·3
Hylobates	3·6	3·58	..	29·1	111·8	..
Hylobates	3·52	3·50	·25	32·1	..	..
Colobus	2·55	2·4	·20	12·8	64·8	8·3
Semnopithecus	2·55	2·4	·25	..	..	..
Cercopithecus	2·0	1·83	·15	14·6	63·1	8·1
Macacus	2·4	2·2	·20	15·6	58·8	10·0
Cynocephalus	3·3	3·0	·30	14·0	57·6	10·5
Cynocephalus	3·0	2·7	·30	..	..	11·1
Ateles	2·65	2·45	·20	19·2	74·2	8·1
Lagothrix	2·7	2·6	·20	19·6	86·6	7·6
Cebus	1·8	1·5	·12	14·5	62·5	8·0
Mycetes	2·8	2·7	·12	18·3	79·4	4·4
Pithecia	1·3	1·2	·10	14·1	75·0	8·3
Brachyurus	1·5	1·4	·13	14·4	70·0	9·2
Nyctipithecus	1·1	·9	·09	11·2	66·6	10·0
Callithrix	1·4	1·25	·09	11·9	67·5	7·2
Chrysothrix	1·25	1·1	·08	12·6	64·7	7·2
Hapale	·85	·7	·08	11·6	56·0	..
Indris	2·25	2·10	·15	11·6	67·7	7·1
Lemur	1·5	1·45	·15	9·7	58·0	10·3
Galago	·83	·74	·06	14·2	67·2	8·1
Loris	1·0	·8	·06	14·0	80·0	8·1
Nycticebus	1·15	1·05	·09	15·6	70·0	8·5
Perodicticus	1·4	1·3	·13	12·7	81·2	10·0
Arctocebus	·89	·80	·09	11·5	72·7	..
Tarsius	·65	·45	·05	14·5	52·9	10·0
Cheiromys	1·2	1·1	·10	14·8	78·5	9·0

DIMENSIONS AND PROPORTIONS OF HUMERUS.

Humerus of	Length from summit of head to bottom of inner margin of trochlea.	Breadth of shaft at its middle.	Breadth of both tuberosities.	Breadth between the condyles.	Spine : 100 :: length of humerus :	Length of scapula : 100 :: that of humerus :	Length of humerus : 100 :: breadth of its shaft :	Length of humerus : 100 :: width of its tuberosities :	Length of humerus : 100 :: breadth between its condyles :
	inches.	inches.	inches.	inches.					
Man	13·4	·85	1·8	2·55	47·0	206·1	6·3	13·4	19·0
Gorilla	17·4	1·25	2·2	3·55	64·4	181·2	7·1	12·6	20·4
T. niger	11·7	·9	1·65	2·7	53·1	177·2	7·6	14·1	23·0
Simia	13·8	·9	1·8	2·65	64·1	197·1	6·5	13·0	19·2
Hylobates	9·1	·35	·70	1·0	73·9	284·3	3·8	7·6	10·9
Hylobates	9·0	..	·65	..	82·5	295·0	..	..	..
Colobus	6·25	·43	·92	1·07	33·4	169·9	6·8	14·7	17·1
Semnopithecus	5·75	·39	·83	1·12	35·9	179·6	6·7	14·4	19·4
Cercopithecus	4·52	·37	·65	·69	36·1	207·3	8·1	14·3	15·2
Macacus	5·75	·40	·90	1·2	44·9	169·1	6·9	15·6	20·8
Cynocephalus	9·2	·78	1·35	1·88	43·1	176·9	8·4	14·6	20·4
Cynocephalus	8·3	·72	1·35	1·88	40·2	180·4	8·6	16·2	22·6
Ateles	7·7	·35	·75	1·07	60·6	233·3	4·5	8·9	13·8
Lagothrix	6·65	·40	·79	1·05	52·3	221·6	6·0	11·8	15·7
Cebus	4·35	·29	·57	·82	42·2	181·2	6·6	13·1	18·8
Mycetes	5·8	·41	·85	1·15	39·6	170·5	7·0	14·6	19·8
Pithecia	3·30	·19	·44	·65	38·8	206·2	5·7	13·3	19·6
Brachyurus	4·15	·23	·54	·70	42·7	207·5	5·5	13·0	16·8
Nyctipithecus	2·51	·16	·32	·48	31·3	185·9	6·3	12·7	19·1
Callithrix	3·5	·20	·43	·61	33·3	189·1	5·7	12·2	17·4
Chrysothrix	2·8	·20	·39	·51	32·1	164·7	7·0	13·9	18·2
Hapale	1·8	·13	·28	·38	30·0	144·0	7·2	15·5	21·1
Indris	5·15	·32	·70	1·14	28·6	166·1	6·2	13·5	22·1
Lemur	4·05	·30	·62	·93	27·3	162·0	7·4	15·3	22·9
Galago	1·62	·11	·25	·40	31·7	147·2	6·7	15·4	24·6
Loris	2·25	·12	·28	·31	39·4	225·0	5·3	12·4	13·7
Nycticebus	2·45	·18	·36	·52	36·5	163·3	7·3	14·2	21·2
Perodicticus	2·90	·25	·50	·73	28·4	181·2	8·6	17·2	25·1
Arctocebus	2·05	·12	·28	·38	29·7	180·3	5·8	13·6	18·5
Tarsius	1·2	·10	·21	·31	38·7	141·1	8·3	17·5	25·8
Cheiromys	2·65	·23	·55	·78	35·8	189·2	8·6	20·7	29·4

DIMENSIONS AND PROPORTIONS OF RADIUS AND ULNA.

Radius and ulna of	Length of radius.	Transverse diameter of its distal end.	Length of ulna.	Spine : 100 :: length of radius :	Length of humerus : 100 :: that of radius :
	inches.	inches.	inches.		
Man	9·90	1·40	10·85	34·7	73·8
T. Gorilla	14·20	1·80	15·00	52·5	81·6
T. niger	10·90	1·31	11·60	49·5	93·1
Simia	13·65	1·54	14·25	63·4	98·9
Hylobates	10·13	·61	10·30	82·3	111·3
Hylobates	9·55	·60	9·75	87·6	106·1
Colobus	5·68	·63	6·60	30·3	90·8
Semnopitheeus	6·25	·64	7·00	39·0	108·6
Cercopithecus	4·4	·45	5·00	35·2	97·3
Macacus	5·50	·62	6·25	42·9	95·6
Cynocephalus	10·18	·95	11·00	47·7	110·6
Cynocephalus	8·35	·99	9·25	40·5	100·6
Ateles	8·00	·60	8·70	62·9	103·8 *
Lagothrix	5·90	·53	6·70	44·6	88·7
Cebus	3·68	·41	4·20	35·7	84·5
Mycetes	5·40	·54	6·10	36·7	93·1
Pithecia	2·80	·31	3·20	32·9	84·8 95·2
Brachyurus	3·15	·39	3·73	32·4	75·9
Nyctipithecus	2·25	·23	2·50	28·1	89·6
Callithrix	2·95	·31	3·30	28·0	84·2
Chrysothrix	2·60	·29	3·00	29·8	92·8
Hapale	1·50	·16	1·87	25·0	83·3
Indris	6·00	·52	6·80	33·3	116·5
Lemur	3·71	·40	4·60	25·0	91·6
Galago	1·67	·15	1·90	32·7	103·0
Loris	2·48	·17	2·64	43·5	110·2
Nycticebus	2·30	·23	2·60	34·3	93·8
Perodicticus	3·10	·36	3·50	30·3	106·8
Arctocebus	2·10	·17	2·23	30·4	102·4
Tarsius	1·55	·14	1·72	50·0	129·1
Cheiromys	2·50	·35	3·00	33·7	94·3

* Sometimes in Ateles the radius is shorter than the humerus.

DIMENSIONS AND PROPORTIONS OF MANUS.

Manus of	Length of manus.	Spine : 100 :: manus :	Rest of pectoral limb : 100 :: manus :	Radius : 100 :: manus :	Length of carpus.	Spine : 100 :: length of carpus :	Length of carpus : 100 :: its breadth :
	inches.				inches.		
Man	7·50	26·3	32·6	75·7	1·4	4·5	161·5
T. Gorilla	9·75	36·1	31·4	68·6	1·5	5·5	166·6
T. niger	9·25	42·0	42·0	84·8	1·25	5·6	160·0
Simia	10·00	46·5	37·4	73·2	1·42	6·6	147·8
Hylobates	5·90	47·9	30·8	58·2	..	..	..
Hylobates	6·00	55·0	32·9	62·8	·73	6·6	82·1
Colobus	5·00	26·7	41·1	88·6	·65	3·4	138·4
Semnopithecus	4·30	26·8	35·2	68·8	·80	5·0	113·7
Cercopithecus	2·90	23·2	32·2	65·9	·53	4·2	..
Macacus	3·60	28·1	32·1	65·4	·60	4·6	166·6
Cynocephalus	6·10	28·6	30·8	59·9	1·08	5·07	150·9
Cynocephalus	5·40	26·2	32·3	64.6	·93	4·5	154·8
Ateles	6·00	47·2	37·0	75·0	·65	5·1	107·6
Lagothrix	4·30	32·5	34·4	72·8	·59	4·4	144·0
Cebus	3·00	29·1	36·1	81·5	·43	4·1	125·5
Mycetes	4·35	29·5	39·1	80·5	·65	4·4	135·3
Pithecia	2·40	28·2	38·7	85·7	·45	5·2	113·3
Brachyurus	3·15	32·4	43·4	100·0	·45	4·6	144·4
Nyctipithecus	2·20	27·5	46·8	97·7	·28	3·5	142·8
Callithrix	..	..	..	..	..	..	..
Chrysothrix	1·80	20·6	33·3	69·2	·34	3·9	126·4
Hapale	1·50	25·0	42·8	100·0	·21	3·5	157·1
Indris	5·30	29·4	47·1	88·3	·58	3·2	134·5
Lemur	3·20	21·6	39·5	86·2	·57	3·8	128·0
Galago	1·51	29·6	46·6	90·4	·17	3·4	142·8
Loris	1·20	21·0	25·8	48·3	·18	3·1	144·4
Nycticebus	..	..	..	..	..	..	..
Perodicticus	2·40	23·6	41·7	77·4	·44	4·3	96·6
Arctocebus	1·30	18·8	33·3	63·7	·25	3·6	96·0
Tarsius	1·80	58·1	45·0	116·1	..	..	..
Cheiromys	4·25	57·4	80·9	170·0	·50	6·7	114·0

DIMENSIONS OF MANUS.

Manus of	Length of first metacarpal.	Length of second metacarpal.	Length of third metacarpal.	Length of fourth metacarpal.	Length of fifth metacarpal.	Length of first phalanx of pollex.	Length of second phalanx of pollex.	First phalanx of third digit.	Second phalanx of third digit.	Third phalanx of third digit.	Length of index with metacarpal.	Length of longest digit with metacarpal.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
												3rd.
Man	1·74	2·70	2·60	2·30	1·97	1·23	·97	1·80	1·24	·83	6·0	6·47
T. Gorilla	1·82	3·75	3·72	3·48	3·30	1·10	·75	2·29	1·60	·82	7·65	8·43
T. niger	1·30	3·38	3·45	3·23	2·98	1·11	·80	2·25	1·74	·83	7·25	8·27
Simia	2·00	3·81	3·93	3·67	3·37	1·10	·60	2·80	1·74	·85	8·35	9·32
Hylobates	1·11	2·26	2·20	1·98	1·77	·70	·36	1·66	1·13	·50	5·18	5·49
Hylobates	1·20	2·23	2·09	1·85	1·62	·78	·42	1·72	1·18	·52	5·37	5·51
Colobus	·67	1·62	1·70	1·63	1·61	·22	..	1·31	·99	·43	3·80	4·43
Semnopithecus	·81	1·67	1·76	1·70	1·69	·49	·17	1·18	·73	·32	3·30	3·99
Cercopithecus	·63	1·03	·96	·92	·87	·35	·20	·70	·45	·27	2·20	2·38
Macacus	·90	1·40	1·39	1·33	1·29	·50	·24	·96	·63	·30	3·10	3·28
Cynocephalus	1·60	2·32	2·30	2·30	2·36	·90	·50	1·44	·90	·48	4·77	5·12
Cynocephalus	1·40	2·06	2·00	1·97	2·00	·80	·42	1·35	·85	·52	4·40	4·72
Ateles	·91	1·84	1·92	1·84	1·80	?	..	1·48	1·03	·52	4·55	4·95
Lagothrix	·81	1·11	1·26	1·25	1·12	·73	·47	1·23	·82	·46	3·40	3·77
Cebus	·65	·84	·90	·86	·72	·51	·33	·82	·53	·35	2·31	2·60
Mycetes	·87	1·20	1·23	1·19	1·16	·73	·49	1·28	·81	·42	3·40	3·74
												4th.
Pithecia	·50	·64	·70	·71	·63	·37	·24	·70	·44	·21	1·69	2·09
Brachyurus	·60	·72	·81	·81	·70	·50	..	·83	·58	..	..	..
												3rd.
Nyctipithecus	·37	·55	·58	·56	·48	·38	·17	·60	·42	·15	1·55	1·75
Callithrix	..	..	..	..	..	..	..	..	..	..	..	1·27
Chrysothrix	·43	·57	·58	·56	·50	·40	·17	·54	·39	·18	1·57	1·69
Hapale	·31	·41	·45	·43	·35	·29	·19	·39	·27	·18	1·18	1·29
												4th.
Indris	1·10	1·67	1·87	1·85	1·84	·98	·42	1·60	·91	·40	3·80	4·82
Lemur	·63	·97	·98	·91	·88	·61	·24	·96	·61	·23	2·58	2·80
Galago	·29	·34	·42	·39	·34	·26	·11	·45	·39	?	·89	?
Loris	·27	·23	·31	·30	·25	·23	·11	·34	·21	·10	·72	1·00
Nycticebus	..	..	..	..	..	..	..	..	..	..	..	..
Perodicticus	·41	·40	·65	·63	·61	·40	·28	·69	·31	·20	·80	2·05
Arctocebus	·30	·23	·32	·32	·30	·26	·20	·28	·15	·10	·44	1·11
												3rd.
Tarsius	·37	·44	·50	·43	·36	·28	·19	·62	·45	·13	1·44	1·70
												4th.
Cheiromys	·43	·61	1·12	·80	·66	·62	·49	1·46	·68	·24	2·72	3·77

PROPORTIONS OF MANUS.

Manus of	Spine : 100 :: pollex with metacarpal :	Spine : 100 :: longest digit with metacarpal :	Spine : 100 :: index with metacarpal :	Spine : 100 :: metacarpal of pollex :	Metacarpal of pollex : 100 :: metacarpal of index :	Metacarpal of third digit : 100 :: its proximal phalanx :	Longest digit : 100 :: pollex with metacarpal :	Manus : 100 :: third metacarpal :	Manus : 100 :: pollex with metacarpal :	Manus : 100 :: first phalanx of third digit :	Manus : 100 :: pollex without its metacarpal :	Manus : 100 :: third digit without its metacarpal :	Longest metacarpal : 100 :: longest digit without metacarpal :
Man	13·8	22·7	21·0	6·1	155·1	69·2	60·8	34·6	52·5	24·0	29·3	51·6	143·3
T. Gorilla	13·5	31·2	28·3	6·7	206·0	61·5	43·5	39·1	37·6	23·4	18·9	48·3	125·6
T. niger	14·5	37·5	32·9	5·9	260·0	65·2	38·8	38·3	35·6	25·0	21·2	53·5	139·7
Simia	17·2	43·3	38·8	9·3	190·5	71·2	39·6	39·3	37·0	28·0	17·0	53·9	137·1
Hylobates	17·6	44·6	42·1	9·0	203·6	75·4	33·4	35·4	35·0	26·7	17·0	53·0	145·5
Hylobates	20·0	50·5	49·2	11·0	185·8	82·2	36·8	32·6	37·5	26·8	18·7	53·4	153·3
Colobus	4·7	23·1	20·3	3·5	241·7	77·0	20·0	34·0	17·8	26·2	4·4	54·6	160·5
Semnopithecus	9·1	24·9	20·6	5·0	206·1	65·1	36·8	..	34·1	26·9	17·2	51·3	126·7
Cercopithecus	9·4	19·2	17·6	5·0	155·5	72·9	48·9	33·1	40·6	24·2	25·8	48·9	137·8
Macacus	12·8	25·6	24·2	7·8	165·5	69·0	50·0	38·6	45·5	26·6	20·5	52·5	135·0
Cynocephalus	14·0	24·0	22 3	7·5	145·0	62·6	58·5	37·7	49·1	23·6	22·9	46·2	121·5
Cynocephalus	12·7	22·7	21·3	6·7	147·1	66·0	54·6	37·0	48·5	24·4	22·5	49·8	132·0
Ateles	7·1	38·9	35·8	7·1	202·1	77·0	18·3	32·0	15·1	24·6	..	50·5	157·1
Lagothrix	15·2	28·5	25·7	6·1	137·0	97·6	53·3	29·3	46·7	28·6	27·9	58·3	199·2
Cebus	14·4	25·2	22·4	6·3	129·2	91·1	57·3	30·0	49·6	27·3	28·0	56·6	188·8
Mycetes	14·2	25·4	23·1	5·9	137·9	104·0	55·8	29·0	48·6	29·7	28·3	58·3	204·0
Pithecia	13·0	24·5	19·8	5·8	128·0	102·8	53·1	29·5	46·2	30·4	25·4	57·5	200·0
Brachyurus	..	..	..	6·1	120·0	102·4	..	25·7	..	26·3	..	..	..
Nyctipithecus	11·5	21·8	19·3	4·6	148·6	103·4	52·5	26·4	41·8	27·2	24·1	53·1	201·7
Callithrix	..	..	..	..	..	..	..	..	..	..	..	..	..
Chrysothrix	11·4	19·4	18·0	4·9	132·5	93·1	59·1	32·2	55·5	30·0	31·6	61·6	191·3
Hapale	13·1	21·5	19·6	5·1	132·2	86·6	61·2	30·0	52·6	26·0	32·0	56·0	186·6
Indris	13·8	27·6	21·1	6·1	151·8	85·5	51·8	36·4	47·1	30·1	26·4	54·9	158·8
Lemur	10·0	18·9	17·4	4·2	153·9	97·9	52·8	30·6	44·6	30·0	26·5	56·2	192·8
Galago	12·9	..	17·4	5·6	117·2	107·1	..	27·8	43·7	29·8	24·5	..	250·0
Loris	10·7	17·5	12·6	4·7	85·1	109·6	61·0	25·8	50·8	28·3	28·3	54·1	225·8
Nycticebus	..	..	..	..	..	..	..	..	..	..	..	..	..
Perodicticus	10·6	20·1	7·8	4·0	97·5	106·1	53·1	27·0	45·4	28·7	28·3	50·0	218·4
Arctocebus	11·0	16·0	6·3	4·3	76·6	87·5	68·4	24·6	58·4	21·5	35·3	40·7	246·8
Tarsius	27·0	54·8	46·4	11·9	118·9	124·0	49·4	27·7	46·6	34·4	26·1	66·6	254·0
Cheiromys	20·8	50·9	36·7	5·8	141·8	130·3	74·2	26·3	36·2	34·3	26·1	56·0	265·1

LENGTH AND PROPORTIONS OF PELVIC LIMB WITH AND WITHOUT THE PES.

Pelvic limb of	Length of entire pelvic limb.	Pelvic limb —pes.	Spine : 100 : : entire pelvic limb:	Spine : 100 : : pelvic limb—pes :	Entire pectoral limb : 100 : : entire pelvic limb:	Pectoral limb—manus : 100 : : pelvic limb—pes :
	inches.	inches.				
Man	41·20	33·40	144·5	117·1	135·0	145·2
T. Gorilla	34·82	26·50	128·9	98·1	85·4	85·4
T. niger	28·00	21·00	127·2	95·4	90·3	95·4
Simia	30·25	19·60	140·6	91·1	82·4	73·4
Hylobates	19·95	15·45	162·1	125·6	78·8	80·8
Hylobates	18·50	13·80	169·7	126·6	75·2	75·8
Colobus	22·15	15·70	118·4	83·9	129·1	129·2
Semnopithecus	21·80	15·93	..	85·1	132·1	130·5
Cercopithecus	14·60	10·70	116·8	85·6	122·6	118·8
Macacus	17·71	12·91	138·3	100·8	119·6	115·2
Cynocephalus	26·90	20·30	126·3	95·3	104·0	102·7
Cynocephalus	24·10	18·35	116·9	89·0	109·0	109·8
Ateles	20·81	14·90	163·8	101·5	93·7*	91·9
Lagothrix	17·70	12·90	134·0	97·7	105·3	103·2
Cebus	13·58	9·96	131·8	96·6	120·1	120·0
Myectes	16·50	11·77	112·2	80·0	106·7	106·0
Pithecia	11·15	7·90	131·1	92·9	129·6	127·4
Brachyurus	13·10	9·28	135·0	95·6	125·9	128·0
Nyctipithecus	9·33	6·43	116·6	80·3	135·2	136·8
Callithrix	..	8·81	..	83·9	..	137·6
Chrysothrix	9·70	6·78	111·4	79·3	134·7	127·7
Hapale	6·65	4·63	110·8	77·1	133·0	132·2
Indris	23·93	17·40	132·9	96·6	144·5	154·6
Lemur	14·32	10·88	96·7	73·5	126·7	134·3
Galago	7·38	5·05	144·7	99·0	167·7	174·7
Loris	6·63	5·03	116·3	88·2	113·3	108·1
Nycticebus	..	5·42	..	80·8	..	..
Perodicticus	9·17	6·72	89·9	65·8	..	116·8
Arctocebus	5·88	4·51	85·2	65·3	113·0	115·6
Tarsius	7·57	5·08	244·1	163·8	130·5	127·0
Cheiromys	10·47	6·99	140·5	94·4	110·2	133·1

* Sometimes, as in No. 4690 in the Museum of the Royal College of Surgeons, the entire pelvic limb is slightly longer than the entire pectoral one.

DIMENSIONS OF OS INNOMINATUM.

Os innominatum of	Length from summit of crest of ilium to bottom of tuberosity of ischium.	Crest of ilium following curves.	Crest of ilium measured by a straight line.	From crest of ilium to spine of ischium.	From spine of ischium to nearest point of its tuberosity.	From ilio-pectineal eminence to tuberosity of ischium.	Length of symphysis.	Antero-posterior diameter of acetabulum.	Conjugate diameter of pelvis.	Oblique diameter of pelvis.	Transverse diameter of pelvis.	Ilio-pubic angle.	Ilio-ischial angle I.*	Ilio-ischial angle II.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.			
Man	9·30	9·20	6·50	3·80	1·45	4·60	1·40	2·19	4·50	4·80	4·75	180°	113°	146°
T. Gorilla	14·75	11·60	8·50	8·80	3·1	5·90	2·00	2·11	7·00	6·00	5·30	130	150	180
T. niger	11·50	6·00	4·25	6·95	1·80	3·90	1·80	1·49	5·40	5·00	4·00	120	172	180
Simia	9·85	6·50	5·00	5·50	1·80	3·48	1·80	1·73	4·50	4·50	3·71	125	153	173
Hylobates	4·75	2·75	1·83	3·10	·60	1·62	1·20	·78	3·00	2·75	2·25	110	140	..
Hylobates	4·75	2·40	1·63	3·25	·60	1·78	1·25	·70	2·95	2·50	1·64	130	147	147
Colobus	5·50	1·82	1·45	3·45	·40	2·00	1·66	·70	2·00	2·20	1·93	102	140	152
Semnopithecus ..	5·46	1·75	1·26	3·63	·53	2·10	1·76	·84	2·12	2·12	1·57	110	160	162
Cercopithecus	4·36	1·25	1·02	2·78	·68	1·60	·94	·51	..	..	..	110	162	170
Macacus	5·40	1·70	1·33	3·13	·84	2·02	1·35	·68	2·12	2·01	1·80	108	164	178
Cynocephalus	7·87	2·75	2·20	4·75	1·25	2·75	2·15	1·00	2·72	3·12	2·64	110	160	165
Cynocephalus	7·80	3·00	2·50	4·70	1·40	3·10	2·40	1·16	3·00	2·92	2·50	110	162	185
Ateles	4·93	2·20	1·54	2·93	1·00	1·68	·90	·70	2·93	2·65	1·95	125	175	{167 / 180
Lagothrix	4·85	1·75	1·09	3·35	·53	1·75	·93	·70	2·82	2·43	1·70	113	170	185
Cebus	3·31	1·00	·73	2·36	·60	1·40	·80	·43	1·58	1·50	1·28	107	187	192
Mycetes	4·50	1·55	1·04	3·08	·60	1·73	·90	·69	2·60	2·52	1·84	115	175	178
Pithecia	2·20	·65	·50	1·60	·36	·90	·60	·44	1·00	1·05	·64	125	180	195
Brachyurus	2·79	·85	·70	1·93	·64	1·28	·60	·50	1·47	1·35	·82	125	180	207
Nyctipithecus	1·97	·44	·34	1·41	·35	·90	·39	·32	·86	·91	·66	115	184	187
Callithrix	2·61	·70	·56	1·84	·40	1·10	·60	·42	1·10	1·09	·91	130	160	175
Chrysothrix	2·25	·70	·55	1·60	·28	·84	·51	·29	·88	1·03	·86	125	160	180
Hapale	1·50	·41	·34	1·09	·21	·65	·49	·19	·60	·72	·52	115	160	165
Indris	4·52	2·00	1·55	3·25	·60	1·88	1·06	·81	1·88	1·80	1·57	135	137	165
Lemur.....	3·70	·80	·62	2·64	·47	1·54	·63	·61	1·50	1·60	1·45	120	165	165
Galago.....	1·52	·30	·29	1·19	·19	·60	·24	·22	·90	·74	·50	115	166	162
Loris	1·46	·31	·30	1·10	·08	·50	·13	·23	·74	·71	·33	88	170	180
Nycticebus	2·02	·40	·33	1·54	·17	·79	·31	·30	1·35	1·11	·71	108	174	170
Perodicticus	2·65	·46	·45	2·03	·19	1·01	·18	·46	1·69	1·34	1·09	119	166	172
Arctocebus	1·67	·32	·30	1·29	·11	·54	·18	·24	1·15	·98	·61	117	168	160
Tarsius	1·17	·24	·24	·93	·14	·43	·19	·17	·70	·68	·48	98	172	166
Cheiromys	2·30	·51	·41	1·49	·48	1·09	·46	·46	·94	·89	·70	125	165	164

* I. = angle formed by ischium with ilio-pectineal line. II. angle formed by ischium with upper (in Man posterior) margin of ilium.

PROPORTIONS OF OS INNOMINATUM.

Os innominatum of	Spine : 100 :: extreme length of os innominatum :	Spine : 100 :: crest of ilium measured by a straight line :	Spine : 100 :: length from ileo-pectineal eminence to tuberosity of ischium :	Length of os innominatum : 100 :: antero-posterior diameter of acetabulum :	Spine : 100 :: distance between inferior (in Man anterior) spinous processes :	Spine : 100 : length of symphysis pubis :	Breadth of pelvis : 100 :: length of os innominatum :	Conjugate diameter of pelvis : 100 :: its breadth :	Length of femur : 100 :: : that of os innominatum :
Man	32·6	22·8	16·1	23·5	7·0	4·8	195·7	105·5	50·2
T. Gorilla	54·6	31·4	21·8	14·3	16·6	7·4	278·3	75·5	101·0
T. niger	52·2	19·3	17·7	12·9	22·7	8·1	287·5	74·0	100·0
Simia	45·8	23·2	16·1	17·5	16·0	8·3	265·4	82·0	96·5
Hylobates	38·6	14·8	13·1	16·4	16·2	9·7	211·1	75·0	56·8
Hylobates	43·5	14·9	16·3	14·7	16·5	11·4	289·6	55·5	64·1
Colobus	29·4	7·7	10·6	12·7	13·1	8·8	284·9	96·5	67·9
Semnopithecus ..	34·1	7·8	13·1	15·3	16·5	11·0	347·7	74·0	65·0
Cercopithecus	34·8	8·0	12·8	11·6	..	7·4	..	..	81·1
Macacus	42·1	10·3	15·7	12·5	18·9	10·5	300·0	84·9	81·0
Cynocephalus	36·9	10·1	12·9	12·7	19·7	10·0	298·1	97·0	71·5
Cynocephalus	37·8	12·1	15·0	14·8	18·2	11·1	312·0	83·3	78·0
Ateles	38·8	12·1	13·2	14·1	17·7	7·0	252·8	66·5	63·2
Lagothrix	36·7	8·2	13·7	14·4	16·4	7·0	285·2	60·2	71·3
Cebus	32·1	7·0	13·5	12·9	16·5	7·7	258·5	81·0	64·2
Mycetes	30·6	7·0	11·7	15·3	14·1	6·1	244·5	70·7	71·7
Pithecia	25·8	5·8	10·8	20·0	11·7	7·0	343·7	64·0	{ 53·6 55·6
Brachyurus	28·7	7·2	13·1	17·9	13·5	6·1	340·2	55·7	58·1
Nyctipithecus	24·6	4·2	11·2	16·2	10·6	4·8	298·4	76·7	60·6
Callithrix	24·8	5·3	10·4	16·0	10·6	5·7	286·8	82·7	59·1
Chrysothrix.....	25·8	6·3	9·6	12·9	12·8	5·8	261·6	97·7	64·6
Hapale	25·0	5·6	10·8	12·6	10·1	8·1	288·4	86·6	66·6
Indris	25·1	8·6	10·4	17·9	11·3	5·8	287·9	83·5	48·0
Lemur	25·0	4·1	10·4	16·4	13·8	4·2	258·7	95·3	63·7
Galago.....	29·8	5·6	11·7	14·4	17·2	4·7	304·0	55·5	56·7
Loris	25·6	5·2	8·7	15·7	14·9	2·2	442·4	44·5	57·2
Nycticebus	30·1	4·7	11·7	14·8	15·9	4·6	274·6	52·5	70·3
Perodicticus	25·9	4·4	9·9	17·3	13·7	1·7	243·1	64·0	77·9
Arctocebus	24·2	4·3	7·8	14·3	14·0	2·5	273·7	53·6	71·3
Tarsius	37·7	7·7	13·8	14·5	22·9	6·1	243·7	68·5	46·0
Cheiromys	31·0	5·5	14·7	20·0	13·1	6·2	328·5	74·4	67·3

DIMENSIONS OF FEMUR.

Femur of	Length of femur.	Transverse diameter at its middle.	Antero-posterior diameter at the same part.	Extreme width at the condyles.	Angle formed by neck with shaft.	Angle formed by shaft with horizon.
	inches.	inches.	inches.	inches.		
Man	18·50	1·05	1·13	3·15	135°	10° 3
T. Gorilla	14·60	1·57	1·26	3·56	128	96
T. niger	11·50	1·10	·83	2·30	135 / 140	90
Simia	10·20	·90	·76	2·30	155	98
Hylobates	8·35	·38	·37	1·02	135 / 145	92
Hylobates	7·40	·37	·39	·93	130	..
Colobus	8·10	·47	·49	1·14	135	..
Semnopithecus	8·40	·42	·48	1·22	135	97
Cercopithecus	5·37	·37	·33	·74	135	93
Macaeus	6·66	·40	·46	1·06	145	92
Cynocephalus	11·00	·70	·72	1·49	133	..
Cynocephalus	10·00	·71	·74	1·61	130	98
Ateles	7·80	·45	·42	1·17	145	95 or 99
Lagothrix	6·80	·40	·42	·94	135	95
Cebus	5·15	·29	·30	·76	135	95
Myectes	6·27	·47	·37	1·02	137	97
Pithecia	4·10	·22	·20	·64	145	95
Brachyurus	4·80	·24	·23	·72	140	91
Nyctipithecus	3·25	·17	·16	·49	140	..
Callithrix	4·41	·22	·21	·60	140	93
Chrysothrix	3·48	·20	·20	·46	138	..
Hapale	2·25	·14	·14	·34	130	..
Indris	9·40	·47	·48	1·00	125	90
Lemur	5·80	·34	·36	·79	132	92 or 103
Galago	2·68	·14	·15	·30	145	90
Loris	2·55	·13	·12	·33	145	95
Nyeticebus	2·87	·19	·19	·46	145	95
Perodicticus	3·40	·27	·27	·53	145	92
Arctocebus	2·34	·13	·14	·34	145	95
Tarsius	2·54	·10	·13	·22	135	94
Cheiromys	3·43	·23	·22	·63	140	95

PROPORTIONS OF FEMUR.

Femur of	Spine : 100 : : length of femur :	Humerus : 100 : : length of femur :	Length of femur : 100 : : its breadth at condyles :	Length of femur : 100 : : breadth of its shaft :
Man	64·9	138·0	17·0	5·6
T. Gorilla	54·0	83·9	24·3	10·7
T. niger	52·2	98·2	20·0	9·5
Simia	47·4	73·9	22·5	8·8
Hylobates	67·8	91·7	12·2	4·5
Hylobates	67·8	82·2	12·5	5·0
Colobus	43·3	129·6	14·0	5·8
Semnopithecus .	52·5	146·1	14·5	5·0
Cercopithecus ..	42·9	118·8	13·7	6·8
Macacus.....	52·0	115·8	15·9	6·9
Cynocephalus ..	51·6	119·5	13·5	6·3
Cynocephalus ..	48·5	120·4	16·1	7·1
Atelcs.....	61·4	101·3	15·0	5·7
Lagothrix	51·5	102·2	13·8	5·8
Cebus	50·0	118·3	14·7	5·6
Myectes	42·6	109·0	16·2	7·4
Pithecia	48·2	124·2	15·6	5·3
Brachyurus ..	49·4	115·6	15·0	5·0
Nyctipithecus ..	40·6	129·4	15·0	5·2
Callithrix	42·0	126·0	13·6	4·9
Chrysothrix ..	40·0	124·2	13·2	5·7
Hapale	37·5	125·8	15·1	6·2
Indris.....	52·2	182·5	10·6	5·0
Lemur	39·1	143·2	13·6	5·8
Galago	52·5	165·4	11·1	5·2
Loris	44·7	113·3	12·9	5·0
Nycticebus	42·8	117.1	16·0	6·6
Perodicticus ..	33·3	117·2	15·5	..
Arctocebus	33·9	114·1	14·5	5·5
Tarsius	81·9	211·6	8·6	3·9
Cheiromys	46·3	129·4	18·3	6·7

DIMENSIONS AND PROPORTIONS OF TIBIA.

Tibia of	Length of tibia.	Greatest breadth between tuberosities.	Antero-posterior diameter of shaft.	Spine : 100 : : length of tibia :	Femur : 100 : : length of tibia :	Humerus : 100 : : length of tibia :	Radius : 100 : : length of tibia :	Length of tibia : 100 : : antero-posterior diameter of shaft :	Length of tibia : 100 : : width at tuberosities :
	inches.	inches.	inches.						
Man	14·90	2·87	1·61	52·2	80·5	111·1	150·5	10·8	19·2
T. Gorilla	11·90	3·40	1·74	44·0	81·5	68·4	83·8	14·6	28·5
T. niger	9·50	2·33	1·17	43·1	82·6	81·0	87·1	12·3	24·5
Simia	9·40	2·30	1·16	43·7	92·1	68·1	68·8	12·3	24·4
Hylobates	7·10	1·02	·50	57·7	85·0	78·0	70·0	7·0	14·3
Hylobates	6·40	·93	.50	58·7	86·4	71·1	67·0	7·8	14·5
Colobus	7·60	1·17	·70	40·6	93·8	121·6	133·8	9·2	15·4
Semnopithecus .	7·53	1·23	·72	47·0	89·6	130·9	120·4	9·5	16·3
Cercopithecus ..	5·08	·71	·40	40·6	94·5	112·3	115·4	7·8	13·9
Macacus	6·25	1·11	·53	48·8	93·8	108·6	113·6	8·4	17·7
Cynocephalus ..	9·30	1·57	·89	43·6	84·5	101·0	91·3	9·5	16·8
Cynocephalus ..	8·35	1·66	·91	40·5	83·5	100·6	100·0	10·8	19·8
Atelcs	7·10	1·12	·57	55·9	91·0	92·2	88·7	8·0	15·6
Lagothrix	6·10	·99	·52	46·2	89·7	91·6	103·3	8·5	16·2
Cebus	4·81	·74	·44	46·7	93·3	110·5	130·7	9·1	15·3
Mycetes	5·50	·99	·58	37·7	87·7	94·8	101·8	10·5	18·0
Pithecia	3·80	·61	·27	44·7	{92·6 / 94·6}	115·1	135·7	7·1	16·0
Brachyurus	4·48	·74	·32	46·1	93·3	107·9	142·2	7·1	16·5
Nyctipithecus ..	3·18	·48	·28	39·7	97·8	126·6	141·3	8·8	15·0
Callithrix	2·40	·56	·31	41·9	99·7	125·7	149·1	7·0	12·7
Chrysothrix ..	3·30	·47	·29	37·9	94·8	117·8	126·9	8·7	14·2
Hapale	2·38	·30	·20	39·6	105·7	132·2	158·6	8·4	12·6
Indris	8·00	1·06	·65	44·4	85·1	155·3	133·3	8·1	13·2
Lemur	5·08	·78	·50	34·0	87·5	125·4	136·9	9·8	15·3
Galago	2·37	·41	·20	46·4	88·3	146·2	141·9	8·4	17·3
Loris	2·48	·32	·15	43·5	97·2	110·2	100·0	6·0	12·9
Nycticebus	2·55	·47	·17	38·0	81·8	104·0	110·8	6·6	18·4
Perodicticus ..	3·32	·60	·27	32·5	97·6	114·4	107·0	8·1	18·0
Arctocebus	2·17	·30	·13	31·4	92·7	105·8	103·3	5·9	13·8
Tarsius	2·54	·25	·18	81·9	100·0	211·6	163·8	7·0	9·8
Cheiromys	3·56	·59	·24	48·1	103·7	131·3	142·4	6·7	16·5

DIMENSIONS AND PROPORTIONS OF PES.

Pes of	Length of pes.	Spine : 100 :: pes :	Rest of pelvic limit : 100 :: pes :	Tibia : 100 :: pes :	Manus : 100 :: pes :	Length of tarsus.	Spine : 100 :: tarsus :	Pes : 100 :: tarsus :	Length of tarsus : 100 :: its breadth :	Carpus : 100 :: tarsus :	Tarsus : 100 :: longest digit without unguis :
	inches.					inches.					
Man	10·10	35·4	30·2	67·7	134·6	4·70	16·4	46·5	48·0	335·6	50·0
T. Gorilla	11·20	41·4	42·2	94·1	114·9	4·45	16·4	39·7	56·1	296·6	81·3
T. niger	8·85	40·2	42·1	93·1	{ * 95·6 / 101·8 }	3·20	14·5	36·1	62·5	256·0	94·6
Simia	11·50	53·4	58·6	122·3	115·0	3·07	14·2	26·6	56·9	216·1	163·8
Hylobates	5·00	40·3	32·3	70·4	84·7	1·40	11·3	28·0	50·0	..	150·0
Hylobates	5·13	47·0	37·1	80·1	85·5	1·40	12·8	27·2	55·0	191·7	157·8
Colobus	7·17	38·3	45·6	94·3	143·4	2·19	11·7	30·4	43·1	336·9	125·5
Semnopithecus .	6·84	42·7	42·9	90·8	159·0	2·30	14·3	33·6	42·6	287·5	97·3
Cercopithecus ..	4·62	36·9	43·1	90·9	159·3	1·53	12·2	33·1	..	288·6	106·7
Macacus	6·00	46·8	46·4	96·0	166·6	1·91	14·9	31·8	50·7	318·3	113·6
Cynocephalus ..	8·10	37·7	39·9	86·0	131·1	2·67	12·5	32·9	53·5	247·2	102·6
Cynocephalus ..	7·40	35·9	40·3	88·6	137·0	2·61	12·6	35·2	60·5	280·6	90·4
Ateles	6·82	53·7	45·1	96·0	113·6	1·84	14·4	26·9	53·2	283·0	152·1
Lagothrix	5·70	43·1	44·1	93·4	132·5	1·80	13·6	31·5	41·1	305·0	134·8
Cebus	4·40	42·7	44·1	91·4	146·6	1·42	13·7	32·2	40·1	330·2	119·7
Mycetes	5·70	38·7	48·4	103·6	131·0	1·70	11·5	29·8	49·4	261·5	138·8
Pithecia	3·72	43·7	47·0	97·8	155·0	1·17	13·7	31·4	45·2	260·0	123·0
Brachyurus	4·30	44·3	46·3	95·9	136·5	1·40	14·4	32·5	42·1	311·1	..
Nyctipithecus ..	3·23	40·3	50·2	101·5	146·8	1·01	12·6	31·2	36·0	360·7	122·7
Callithrix	..	..	..	..	..	..	..	..	..	..	..
Chrysothrix....	3·20	36·7	47·1	96·9	177·7	·97	11·1	30·3	39·1	285·2	125·7
Hapale	2·35	39·1	50·7	98·7	156·6	·66	11·0	28·0	39·3	330·0	131·8
Indris	7·05	39·1	40·5	88·1	133·0	1·92	10·6	27·2	45·8	331·0	163·5
Lemur.....	4·50	30·4	41·3	88·5	140·6	1·60	10·8	35·5	40·0	280·7	111·2
Galago.....	2·57	50·3	50·8	108·4	170·1	1·24	24·3	48·2	16·9	723·5	76·6
Loris	1·82	31·9	36·1	73·3	151·6	·58	10·1	31·8	44·8	322·2	170·6
Nycticebus	..	..	..	..	..	..	..	..	..	..	..
Perodicticus ..	..	..	..	..	..	..	..	..	..	..	..
Arctocebus	1·64	23·7	36·3	75·5	126·1	·50	7·2	30·4	48·0	200·0	164·0
Tarsius	2·72	87·7	53·5	107·0	151·1	1·22	39·3	44·8	15·5	..	80·3
Cheiromys	4·02	54·3	57·5	115·5	94·5	1·23	16·6	30·5	34·9	246·0	152·0

* In the skeleton No. 5083 A. the pes is a little longer than the manus, not so in Nos. 5082 & 5084.

DIMENSIONS OF PES.

Pes of	Length of first metatarsal.	Length of second metatarsal.	Length of third metatarsal.	Length of fourth metatarsal.	Length of fifth metatarsal.	First phalanx of hallux.	Second phalanx of hallux.	First phalanx of third digit.	Second phalanx of third digit.	Third phalanx of third digit.	Length of index with its metatarsal.	Length of longest digit with its metatarsal.	Length of os calcis.	Dorsum of navicelare.	Dorsum of cuboid.	Length of longest digit without metatarsal.
	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.
Man	2·44	3·00	2·82	2·70	2·95	1·50	1·03	1·00	·48	·47	5·35	2nd 5·35	3·17	·62	1·27	2·35
T. Gorilla	2·46	3·20	3·18	3·11	3·40*	1·32	·85	1·77	1·20	·70	6·50	3rd 6·80	3·26	·50	·93	3·62
T. niger	2·08	2·71	2·62	2·35	2·63	1·20	·90	1·48	·95	·60	5·60	5·65	2·40	·40	·80	3·03
Simia	1·95	3·70	3·60	3·30	3·18	·98	?	2·63	1·51	·80	8·25	8·63	2·10	·46	·80	5·03
Hylobates	1·33	1·72	1·59	1·49	1·45	·62	·37	1·09	·68	·33	3·53	3·69	·94	·23	·47	2·10
Hylobates	1·36	1·67	1·57	1·47	1·43	·68	·49	1·11	·70	·40	3·53	3·78	·89	·20	·40	2·21
Colobus	1·34	2·25	2·44	2·40	2·34	·62	·30	1·30	·95	·50	4·32	5·19	1·44	·31	·48	2·75
Semnopithecus	1·34	2·20	2·28	2·32	2·42	·55	·24	1·18	·75	·31	4·12	4·52	1·60	·31	·54	2·24
Cercopithecus ..	·93	1·39	1·49	1·44	1·30	·45	·29	·86	·46	·31	2·70	3·12	1·03	·22	·38	1·63
Macacus	1·29	1·79	1·89	1·86	1·85	·65	·30	1·07	·70	·40	3·55	4·06	1·32	·27	·49	2·17
Cynocephalus ..	2·13	2·56	2·67	2·60	2·67	·94	·53	1·44	·88	·41	5·13	5·41	1·84	·37	·72	2·74
Cynocephalus ..	1·80	2·30	2·38	2·28	2·27	·81	·50	1·19	·82	·35	4·69	4·74	1·83	·32	·64	2·36
Ateles	1·29	2·15	2·03	2·00	2·04	·80	·46	1·40	·90	·50	4·69	4·83	1·43	·33	·49	2·80
Lagothrix	1·13	1·62	1·62	1·61	1·60	·73	·40	1·19	·80	·42	3·80	4·03	1·25	·28	·36	2·41
Cebus	·90	1·23	1·32	1·29	1·28	·50	·34	·88	·54	·28	2·86	3·02	·99	·15	·37	1·70
Mycetes	1·21	1·60	1·71	1·70	1·58	·72	·43	1·12	·79	·45	3·80	4th 4·07	1·21	·25	·43	2·36
Pithecia	·75	1·09	1·18	1·20	1·23	·42	·28	·71	·50	·25	2·30	2·64	·83	·20	·23	1·44
Brachyurus	·79	1·29	1·34	1·39	1·50	·54	..	·82	·58	..	..	..	·94	·23	·35	..
Nyctipithecus ..	·60	1·00	1·00	1·01	1·01	·40	·20	·61	·43	·20	2·09	3rd 2·24	·65	·20	·27	1·24
Callithrix	..	..	..	..	..	..	..	..	..	..	..	..	·85	..	..	
Crysothrix	·63	1·03	1·03	1·05	1·09	·39	·23	·58	·41	·23	2·12	2·25	·68	·22	·26	1·22
Hapale	·41	·72	·82	·83	·84	·24	·11	·42	·28	·17	1·52	1·70	·47	·12	·19	·87
Indris	1·95	2·00	2·04	2·07	2·02	1·15	·60	1·71	1·05	·44	..	4th 5·21	1·37	·31	·53	3·14
Lemur	1·06	1·25	1·21	1·14	1·15	·61	·32	·94	·62	·22	2·81	2·92	1·00	·24	·46	1·78
Galago	·45	·42	·43	·40	·42	·30	·17	·46	·27	·10	1·13	1·35	·97	·69	·26	·95
Loris	·47	·45	·47	·43	·44	·27	·18	·51	·34	·14	1·11	1·42	·36	·12	·17	·99
Nycticebus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Perodicticus ..	·60	·58	·68	·66	·65	·45	·31	·71	·41	·24	1·40	2·24	·57	·21	·26	1·58
Arctocebus	·41	·33	·35	·34	·33	·29	·21	·34	·18	·13	·90	1·16	·34	·09	·14	·82
Tarsius	·46	·41	·52	·54	·50	·31	·13	·42	·20	·11	·95	1·52	1·13	·83	·10	·98
Cheiromys	·87	·91	·98	·99	1·00	·48	·30	·87	·60	·40	2·50	2·86	·85	·19	·34	1·87

* Including the backwardly extending process, otherwise the fifth metatarsal is shorter than the fourth.

PROPORTIONS OF PES.

Pes of	Spine : 100 :: hallux with metatarsal :	Spine : 100 :: longest digit with metatarsal :	Spine : 100 :: index with metatarsal :	Spine : 100 :: metatarsal of hallux :	Longest digit : 100 :: hallux with metatarsal :	Pes : 100 :: second metatarsal :	Pes : 100 :: hallux with metatarsal :	Pes : 100 :: hallux without metatarsal :	Pes : 100 :: third digit without metatarsal :	Longest digit of manus with metacarpal : 100 :: that of pes with metatarsal :	Longest metatarsal : 100 :: longest digit without metatarsal :	Pollex : 100 :: hallux (with metacarpal and metatarsal) :	Index of manus : 100 :: that of pes :	Spine : 100 :: os calcis :	Os calcis : 100 :: cuboides :
Man	17·4	18·7	18·7	8·5	92·8	29·7	49·2	25·0	19·3	82·6	78·3	126·1	89·1	11·1	40·0
T. Gorilla	17·1	25·1	24·0	9·1	68·0	28·5	41·3	19·3	32·7	80·6	113·1	126·1	84·9	12·0	28·5
T. niger	18·2	25·5	25·4	9·4	73·9	30·6	47·2	25·1	34·2	68·3	111·8	130·2	77·2	10·9	33·3
Simia	13·6	40·1	38·3	9·0	33·9	32·1	25·4	8·5	42·9	92·5	135·9	79·1	98·8	9·7	38·1
Hylobates	18·8	30·0	28·6	10·8	62·8	34·4	46·2	19·8	42·0	67·2	122·0	106·9	68·1	7·6	50·0
Hylobates	23·2	34·6	32·3	12·4	66·9	32·5	49·3	22·8	43·0	68·6	132·3	105·4	65·7	8·1	44·9
Colobus	12·0	27·7	23·1	7·1	43·5	31·3	31·5	12·5	38·3	117·3	112·7	253·9	113·6	7·7	33·3
Semnopithecus .	13·3	28·2	25·7	8·3	47·1	32·1	31·1	11·5	32·7	113·2	96·5	144·8	124·8	10·0	33·7
Cercopithecus ..	13·3	24·9	21·6	7·4	53·5	30·0	36·1	..	35·7	131·0	109·3	141·5	122·0	8·1	36·8
Macacus	18·1	31·7	27·7	10·0	57·1	29·8	38·8	15·8	36·1	123·7	114·8	141·4	114·5	10·3	37·1
Cynocephalus ..	16·9	25·4	24·0	10·0	66·5	31·6	44·4	18·1	33·7	105·6	102·4	120·0	107·5	8·6	39·1
Cynocephalus ..	15·1	23·0	22·2	8·7	65·6	31·0	42·0	17·7	31·8	101·0	99·1	118·7	106·5	8·8	34·9
Ateles	20·0	38·0	36·9	10·1	52·7	31·5	37·3	18·4	41·0	97·5	130·2	280·2	103·0	11·2	34·2
Lagothrix	17·1	30·5	28·7	8·5	56·0	28·4	39·6	19·8	42·2	106·8	148·7	112·4	111·7	9·4	28·8
Cebus	16·8	29·3	27·6	8·7	57·6	27·9	39·2	19·0	38·6	116·1	128·7	116·7	123·8	9·6	37·3
Myeetes	16·0	27·6	25·8	8·2	57·9	28·0	41·4	20·1	41·4	108·8	138·6	112·9	111·7	8·2	35·5
Pithecia	17·0	31·0	27·0	8·8	54·9	29·3	38·9	18·8	38·7	126·3	120·0	130·6	136·0	9·7	25·3
Brachyurus ...	..	..	..	8·1	..	30·0	..	..	..	..	..	..	..	9·6	37·2
Nyctipithecus ..	15·0	28·0	26·1	7·5	53·5	30·9	37·1	18·5	37·7	128·0	122·7	132·6	134·8	8·1	41·5
Callithrix	..	..	..	..	..	..	..	..	..	..	..	..	..	8·1	..
Chrysothrix ..	14·3	25·8	24·3	7·2	55·1	32·1	39·1	19·3	38·1	133·1	116·1	125·0	135·0	7·8	38·2
Hapale	12·6	28·3	25·3	6·8	44·7	30·6	32·3	14·8	37·0	132·5	106·0	96·2	128·8	7·8	40·4
Indris	20·5	28·9	..	10·8	71·0	28·3	52·4	24·8	45·3	108·0	151·6	148·0	..	7·6	38·6
Lemur.....	13·4	19·7	18·9	7·1	68·1	27·7	44·2	20·6	39·5	104·2	142·4	134·4	108·9	6·7	46·0
Galago	18·0	26·4	22·1	8·8	68·1	16·3	35·7	18·2	32·2	..	220·9	139·3	126·9	19·0	26·8
Loris	16·1	24·9	19·4	8·2	64·7	24·7	50·5	24·7	54·3	142·0	210·6	150·8	154·1	6·3	47·2
Nycticebus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Perodicticus ..	13·3	21·9	13·7	5·8	60·7	..	..	..	..	109·2	232·3	..	166·6	5·5	45·6
Arctocebus	13·1	16·8	13·0	5·9	78·4	20·1	55·4	30·4	39·6	104·5	234·2	119·7	204·5	4·9	41·1
Tarsius	29·0	49·0	30·6	14·8	59·2	15·0	33·1	16·1	26·8	89·4	181·4	107·1	65·9	36·4	8·8
Cheiromys	22·2	38·6	33·7	11·7	57·6	22·6	41·0	19·4	46·5	75·8	188·8	107·1	91·9	11·4	40·0

EXCEPTIONAL FORMS.

Having now enumerated the principal modifications in the form, size, and proportions of the several segments and bones entering into the composition of the appendicular skeleton, it is desirable to consider the more remarkable points of structure presented by some of the most specially modified and peculiar forms of the order, such as Man, the Orang, Hapale, Indris, Loris, Tarsius, and Cheiromys.

Man.

Although the arm and hand of Man are exceeded in absolute length by the pectoral limb of Troglodytes and Simia, yet his leg, both with and without the foot, presents an absolute length of limb such as exists in no other member of the Order.

The length of the whole pectoral limb, compared with that of the spine, is remarkably short when contrasted with the proportions existing in the highest Apes; but some of the lower Simiidæ and Cebidæ resemble Man closely in this respect, while in others of them, as also in all the Lemuridæ, it (the whole pectoral limb) has a less relative length (often much less) than in him—Arctocebus falling almost as much below Man, in this respect, as the Chimpanzee exceeds him.

The proportion borne by the arm without the hand to the spine presents us with nearly similar conditions.

The length of the whole pelvic limb, when compared with that of the spine, is considerably greater than in the majority of the Order; nevertheless this relative size is approached in Simia and Cheiromys, equalled in Galago, surpassed in Hylobates * and Ateles, and very greatly so in Tarsius, in which it much more exceeds the next greatest proportion than that of Man exceeds that of the smallest of the Order.

The length of the leg without the foot, compared with that of the arm without the hand, is still more exceptional, far exceeding, as it does, that of any other Primates except Indris and Galago; yet in those genera it is considerably greater still.

The proportion borne by the leg without the foot to the spine is much greater than in any other of the Primates, except Hylobates and Tarsius, where it is still greater; in the last, indeed, exceeding the proportion in Man more than that exceeds the proportion existing in any other forms save only Perodicticus and Arctocebus.

The *scapula* is surpassed in absolute size by that of the Gorilla, and is nearly equalled by that of the Chimpanzee and that of the Orang.

If its axillary margin be taken as the standard of comparison, then the vertebral margin is longer in Man than in any other Primate, except perhaps Perodicticus, and much longer than in any one except the Gorilla; while the anterior margin is considerably shorter than in any others of the Primates, except the Simiinæ, Ateles, Indris, and sometimes, perhaps, Mycetes.

The posterior vertebral angle is more acute than in most species of the Order, and greatly more so than in some; nevertheless it is not so acute as in the Simiinæ, Ateles, and Arctocebus.

The anterior vertebral angle is sharp and marked † to a degree rarely, if at all, met with in the Order besides, except in Troglodytes.

* Professor Huxley truly observes that, thus compared, Hylobates is as much longer in the legs than Man, as Man, is longer in the legs than the Gorilla.—Man's Place in Nature, p. 72.

† Not so, however, in the male and female Boschisman, Nos. 5357 & 5357A, in the Museum of the Royal College of Surgeons.

The angle formed by the spine of the scapula with the axillary margin is probably more obtuse than in any other Primate.

The breadth of the glenoid surface, compared with its length, is greater than in almost any other of the Order; nevertheless it is approached by that of the Gorilla, and exceeded, sometimes at least, by that of Ateles.

The proportion of the supraspinous fossa to the infraspinous one is smaller than in the great bulk of the Order; nevertheless it is larger than in the Pitheciinæ, Nycticebus tardigradus, and Tarsius.

The anterior margin is scarcely ever convex, and the suprascapular notch is well marked, thus differing from the Simiidæ and Lemuroidea; but then in many of the Cebidæ it is much more defined than in Man.

The surface for the *teres major* is more strongly marked than in the Simiinæ, or than in Indris, Loris, and Nycticebus, but it is not so much so as in others, *e. g.* the lower Simiidæ, Cebus, and Chrysothrix.

At the vertebral end of the spine there is a flat triangular surface, absent or less marked in most, but present in Mycetes, Loris, and Arctocebus.

The root of the spine approaches the glenoid surface more nearly than in the Gorilla and Hylobates, but yet not so closely as in the lower Simiidæ and Cebidæ.

Unlike the bulk of the Primates, the infraspinous fossa, close to the glenoid surface, is wider than the supraspinous one; but then Perodicticus, Pithecia, Loris, and Nycticebus resemble Man in this respect.

The spine differs from that of most Primates in not being grooved below (in all but Man behind) at its base; but then it is not so either in the Simiinæ, Ateles, Indris, or Loris.

The coracoid process is largely developed, and projects more away from the glenoid surface than in any Simiidæ; in many of the Lemuroidea, however, it is much the same as in Man (Pl. XII. fig. 2).

The acromion is so produced that (the long axis of the glenoid surface being vertical) it would meet, or nearly so, a plane bisecting the glenoid surface vertically and produced upwards; and it rises at least as high as does the coracoid. In these points Man differs from the bulk of the Primates, including the lower Simiidæ, but agrees with the Simiinæ and Lemur.

The ridge for the trapezoid ligament is less marked than in most Primates, but more so than in others, as, *e. g.*, Indris, Lemur, Loris, and Cheiromys.

The *Clavicle*.—The length of this bone, compared with that of the spine, is greater than in any others, except the Simiinæ, but it falls short of the extreme proportion of Hylobates about as much as it exceeds the very small one of Nyctipithecus.

Its length, as compared with that of the scapula, is greater than in any other Primates, except Simia and Hylobates.

The subacromial surface is almost always convex, thus differing from nearly all the rest of the order; but the Simiinæ and Nycticebinæ are more or less similar to Man in this respect.

The sigmoid curvature of the bone is more marked than in the great majority of forms; but some of the Cebidæ and Nycticebinæ are similar to him.

The *humerus* is longer, as compared with the spine, than in the great bulk of the order; but its relative length is exceeded in the Simiinæ, Ateles, and Lagothrix—the Gorilla and Orang surpassing Man in this respect almost as much as he exceeds Perodicticus.

The articular head looks much more inwards and less backwards than in any other Primate. The tuberosities do not quite rise to the summit of the head, thus differing from some; but then in Lagothrix, Ateles, Simia, and Hylobates they do not rise as high as they do in Man.

The bicipital groove extends about one-third down the bone, and is more marked than it generally is in the Simiinæ, but much less so than it is in the lowest Simiidæ.

The supinator ridge is moderate in size, and much less developed than in the lower Simiidæ and most Lemuroidea; on the other hand, it is more developed than in Hylobates.

The external condyle is a moderate process distinct from the capitellum, and, unlike its position in most Primates, looks forwards and backwards, as in the Simiinæ, Ateles, and Indris.

The projection of the ulnar ridge of the trochlea is again intermediate between other forms as to its extent. The same may be said of the distinctness of its radial ridge and the depth of the olecranal fossa; but the musculo-spiral groove is more marked than in any other Primate.

Radius.—In absolute length the radius of Man is not only exceeded by that of the whole of the Simiinæ (except the smallest Gibbons), but by that of the largest of the Cynocephali also. The diameters of its two extremities, however, are greater than in any other Primates, except Troglodytes and Simia.

Its proportionate length to the spine is smaller than in almost all the Simiidæ. It exceeds that, however, existing in the lower Cebidæ, in Hapale, and in all the Lemuroidea except Loris and Tarsius.

Its proportion to the humerus is characteristic, being generally less than in any other Primate, and only approached by the Gorilla, Brachyurus, and Hapale.

Its thickness, in relation to its length, is also extreme.

The shaft is moderately curved, more so than in many Primates, but less so than in some others, *e. g.* the Gorilla, Cebus, Indris.

The bicipital tubercle is as marked as in any of the Order.

The ulnar margin is sharp, as in the lowest Simiidæ, not rounded as in many others, *e. g.* Troglodytes.

The ridge for the origin of the *flexor sublimis digitorum* is marked, thus differing from all but the lowest Simiidæ and some Lemuroidea, *e. g.* Indris, Arctocebus.

The excavation for the origin of the *flexor longus pollicis* is more marked than in most forms, as is also the rough surface for the insertion of the *pronator teres*.

The excavation for the origin of the *extensores pollicis* is again more marked than in

most, though it is very much so sometimes in some, *e. g.* the larger Cynopithecinæ, Chrysothrix, and Hapale.

The radial margin is unusually sharp, yet not so much so as it is in the Cynopithecinæ, and sometimes in Cebus, Lemur, and Galago.

The ulnar angle of the surface for the scapho-lunar articulation is slightly produced, but not so much so as in some, as, *e. g.*, the Gorilla, while in very many species it is not at all so.

The styloid process is exceptionally long, rivalled, however, by that in some Simiinæ.

The grooves for the extensor tendons are unusually distinct; and that for the *extensor secundi internodii pollicis** I have only found distinct in the Chimpanzee and Orang amongst Apes.

The ulna is separated by a wider interval from the shaft of the radius in Man than in most Primates, but not so much so relatively as in some, *e. g.* as in Troglodytes, Cebus, Indris.

The greater sigmoid cavity is exceptionally broad, differing in this from all others except Troglodytes and Simia.

The lesser sigmoid cavity looks outwards and not forwards, in which it differs from almost all Primates, and is most nearly approached by Troglodytes, Simia, and the Nycticebinæ.

The olecranon is very broad, indeed at its maximum in breadth compared with length. It is most closely approached, however, in this respect by the Simiinæ. It is not much excavated at its apex, as is so often the case (*i. e.* much excavated) in the Order.

The anterior surface of the bone is distinctly marked off from its inner (ulnar) side, by which it differs from the great bulk of the order, by Troglodytes and, to a less degree, by Simia only resembling it.

The fossa for the *extensores pollicis* is marked in a way existing in no other of the Simiidæ except Simia and Hylobates. However, the genera Chrysothrix, Hapale, Lemur, Galago, Nycticebus, and *especially* Arctocebus, resemble Man in this fossa being distinct. In the last of these it is more marked than that for the *flexor profundus digitorum*.

The surface for the *supinator brevis* is deep and broad, as only in Troglodytes besides, being narrower in the other Simiidæ.

The ridge for the attachment of the *pronator quadratus* is less marked than in many of the Order, but more so than in others.

The head of the ulna is large and rounded, and bears a proportion to the styloid process larger than that existing in any other of the Primates except the Simiinæ.

The styloid process is moderate, not so long as in many (especially Ateles and the Nycticebinæ), but longer than some (*e. g.* Gorilla and Orang).

Manus.—The whole manus of Man is exceeded in actual length by that of Troglodytes and Simia only. Its length, as compared with that of the spine, however, is less than in

* This is not constant in Man; at least no trace of it exists in the Boschisman and the Australian (No. 5184) in the Museum of the Royal College of Surgeons.

the bulk of the Order, but not so small as in the lower Simiidæ, and much greater than in some of the lowest Cebidæ, Lemur, and the Nycticebinæ*.

Its length, as compared with that of the arm, is nearer the lower limit of the Order, as it is exceeded by all except the Gorilla, sometimes Hylobates, some of the lower Simiinæ, and Loris; and that of Cheiromys exceeds Man's more than his exceeds the least of the Order, while the difference between the last and that of Cheiromys is much exceeded by the difference between the proportions of Cheiromys and Tarsius.

Its length compared with the radius much exceeds that in Loris, but is almost as much exceeded by that in Hapale, which is again surpassed to a much greater degree by that in Cheiromys.

The number of carpal bones is very exceptional, still (as we have seen) there are but eight, not only in Troglodytes, but also in the widely different Indrisinæ.

The small relative size of the pisiforme distinguishes the manus of Man from almost all Primates, but Simia and the Nycticebinæ resemble him in this. Simia and Troglodytes agree with Man in the absence of direct connexion between the cuneiforme and ulna.

The trapezium has a more concave surface for the pollex than in almost any other Primate; but in the Gorilla and in Simia there is sometimes almost, if not quite, as deep a concavity.

The os magnum predominates over the other carpals more in Man than in other Primates, and the unciforme has its process directed more forwards (palmad) and less towards the digits; but in the latter respect Man is closely resembled by the Nycticebinæ.

The metacarpals (in a skeleton of ordinary size) are exceeded in actual length only by those of Simia and Troglodytes, except the fourth and fifth ones of the Siamang.

The length of the third metacarpal, compared with that of the entire manus, is less than in most Simiidæ, but it exceeds that of the same bone in all Primates below that family except Indris.

The length of the metacarpus compared with that of the spine (as estimated by the same metacarpal) is very much less than in some, *e. g.* Hylobates; much greater than in others, *e. g.* the Nycticebinæ.

The proximal ends of some of the metacarpals have more concave articular surfaces than in most genera.

The distal articular surfaces are somewhat less developed dorsally than in other forms.

The first metacarpal, as compared with the spine, is considerably longer than in some, *e. g.* Perodicticus, but is still more exceeded by others, *e. g.* Hylobates and Tarsius.

In the proportion borne by the pollex, index, and third digits (including their metacarpals) to the spine, as also in the length of the metacarpal of the index as compared with that of the pollex, Man holds an intermediate position in the Order.

As regards the proportion of the pollex to the longest digit (metacarpals included),

* *I. e.* as far as can be judged from the limited comparisons which have been made for this paper. I have had no opportunity of examining Nycticebus; and Perodicticus may sometimes, of course, be longer in the manus than in the specimens examined.

that of Man exceeds the other Primates, except Hapale, Loris, Arctocebus, and Cheiromys.

The absolute length of the pollex, both with and without its metacarpal, is absolutely greater in Man than in any other Primate that I have measured*.

The proportion borne by the pollex, without its metacarpal, to the entire manus exceeds that in all others except Chrysothrix, Hapale, and Arctocebus.

The length of the first phalanx of the third digit, as compared with that of the entire manus, is smaller in Man than in any others of the Order except the Gorilla, some of the lower Simiidæ, and Arctocebus.

The proportion borne by the same first phalanx to its metacarpal is less than that in any other Primates except Troglodytes and some of the Simiidæ other than the Simiinæ.

The length of the third digit, without its metacarpal, compared with that of the manus, is greater than in some and less than in others; and the human proportion is almost as much exceeded in Chrysothrix as it exceeds that in Arctocebus.

In the length of the first phalanx of the same digit, compared with that of the whole manus, as in the proportion borne by longest digit, without its metacarpal, to the longest metacarpal, Man exceeds some and is exceeded by others.

Os innominatum.—This is perhaps the most characteristic bone in the appendicular skeleton of Man.

In absolute size the human pelvis is vastly exceeded by that of the Gorilla†, and in length by that of the Chimpanzee and that of the Orang.

The human pelvis is also distinguished by the almost constant ‡ excess of its transverse over its conjugate diameter, and by the absence of an ilio-pubic angle §.

The absolute length of a straight line joining the superior spinous processes of the ilium, and the proportion of the same to the spine, are greater than in any other Primate except the Gorilla. The latter species exceeds to a less degree when the crest of the ilium is measured along its curves.

The ilio-ischial angles are less than in any other Primate, but the length of a line drawn from the ilio-pectineal eminence to the nearest point of the tuberosity of the ilium is greater, as compared with that of the spinal column, than in any other of the Primates, except Troglodytes and Simia.

The vertical diameter of the acetabulum, compared with the length of the os innominatum, is greater than in all the rest of the Order.

* Dr. Lucae, however, found the pollex of the Chimpanzee (both with and without the metacarpal) slightly longer than that of the European woman.—*Loc. cit.* p. 306.

† Trans. Zool. Soc. vol. v. p. 12.

‡ As Professor Huxley has pointed out (Medical Times, 1864, vol. i. p. 344), the transverse diameter is less than the conjugate one in the female Boschisman's skeleton, No. 5357A. in the Museum of the College of Surgeons. In Nos. 5257 and 5300 in the same collection the two are about equal. Mr. John Wood gives an instance of the same predominance of the antero-posterior diameter in a male negro, and quotes instances from Professor Weber.—Todd's Cyclopædia, vol. v. pp. 150 & 151.

§ John Wood, *loc. cit.* p. 152.

The distance between the superior posterior spinous process of the ilium and the tuberosity of the ischium, as compared with the length of a line joining the inferior anterior spinous process with the symphysis pubis, is least in Man of all Primates.

The same is the case with the proportion of the length of the os innominatum to that of the transverse diameter of the brim of the pelvis, and with the distance between the inferior posterior spinous process and the spine of the ischium, when compared with that between the inferior anterior spinous process and the pubic symphysis.

The length of the os innominatum, as compared with that of the femur, is less in Man than in any other Primate except Indris and Tarsius.

The crest of the ilium, measured along its curves, almost or quite equals, sometimes even exceeds, the extreme length of the os innominatum—a condition existing in Man alone of all the Order. Moreover, the crest has a degree of sigmoid curvature, and is generally thickened above the acetabulum in a way existing in no other Primate; and the superior anterior spinous process is rather more distinct than in any other genus of the Order.

The inferior anterior spinous process is developed to a greater extent than in any other of the Anthropoidea, but it is exceeded by that of some Lemuroidea.

The posterior spinous processes are more sharp and distinct than in other Primates, and are nearer together, in comparison with the length of the os innominatum, than in any other except Loris.

The outer surface of the ilium is at the same time convex anteriorly and concave posteriorly to a degree existing in no other Primate; moreover, the gluteal lines are much marked, and the iliac fossa is very wide, very concave, and looks mainly inwards —conditions peculiar to Man.

The spine of the pubis is more marked than in most forms, and the superior surface of the so-called horizontal ramus of the pubis is generally broadened, and the subpubic groove in most cases marked to a degree existing in no other Primate *.

The pubic symphysis is shorter relatively than in any other of the Anthropoidea.

The shortness of the body of the ischium, the smallness and non-eversion of the tuberosities of the ischium, and their prolongation backwards and upwards to very near the spine of the ischium, are characters almost peculiar to Man, but not quite so, because they exist in the Nycticebinæ, especially in Loris. Man, however, is the only Primate in which these characters coexist with a broadly expanded ilium.

The heart-shaped brim of the pelvis, so general in Man, exists in no other member of the Order.

The spine of the ischium is generally developed in Man in a way absolutely peculiar to him †, as also is the great concavity of the sciatic notches.

* In skeleton No. 5184 in College of Surgeons, the ramus is very narrow; and in 5357A. the subpubic groove is so faint as to be hardly distinguishable.

† In the skeleton of a male and female of Boschisman race in the College of Surgeon's Museum, the spine is very small, as Mr. John Wood has remarked (*loc. cit.* p. 149). Indeed, in the female it is scarcely larger, though more pointed, than in the Orang.

When the outer surface of the blade of the ilium is looked at, about two-thirds of the acetabulum are visible, thus differing from the Simiinæ, but agreeing with the bulk of the order.

Femur.—The femur attains an absolute length much exceeding that of any other Primate; nevertheless, the transverse diameter of the shaft is absolutely greater in the Gorilla.

The angle formed by the neck with the shaft is greater than exists in some other Primates, but is less than in many. The angle formed by the shaft with a horizontal surface, on which both condyles are made to rest, deviates more from a right angle than in any other Primate, though in this there is greater difference between inferior forms.

The proportion of the femur to the spine is greater than in any other genus of the Primates except Hylobates and Tarsius, in which it is still larger. It is, however, very nearly approached in Ateles; and Tarsius exceeds Man, in this proportion, much more than Man exceeds the Gorilla.

The length of the femur, compared with that of the humerus, is much greater than in any other of the Anthropoidea, and very much greater than in the Simiinæ; nevertheless, I find it (thus compared) exceeded in all the Lemuroidea I have examined except the Nycticebinæ and Cheiromys—Tarsius exceeding Man much more than he exceeds even Simia.

Its length, compared with that of the os innominatum, is greater than in any other of the Anthropoidea; nevertheless, it is exceeded in Indris and Tarsius.

The angularity of the shaft and the prominence of the linea aspera are greater than in any other Primate, as also, most probably, the prolongation of the latter to the outer condyle.

The trochanteric fossa is rather more shallow than in most, but not so much so as in the Gorilla and Perodicticus; and in the remaining characters of the femur Man occupies an intermediate position.

The tibial trochanter is as small as, or smaller relatively, than in any other Primate, and the intertrochanteric line in front (as in the largest Cynocephali) is very distinct. The two condyles are pretty equally developed as to projection backwards (differing thus from the Simiinæ and others), but the inner condyle descends peculiarly. Still in this the difference between Man and certain Apes * is less than that between forms of the Order inferior to him.

The rotular surface differs from that of all other Primates in the great predominance of that part of it which is supported by the external condyle. The transverse concavity of the rotular surface is greater than in the Simiinæ† and Nycticebinæ, but it is exceeded in the Lemuroidea other than the last-named subfamily.

* See, *e. g.*, the femur of Ateles (No. 4708 in the Museum of the Royal College of Surgeons), where the descent of the inner condyle is very marked indeed.

† Owen, Trans. Zool. Soc. vol. v. p. 16, as regards Troglodytes.

Tibia.—This bone in Man is again absolutely longer than in any other Primate, and absolutely broader at its proximal end than in all but the Gorilla.

Its length, as compared with that of the spine, is (like that of the femur) greater than in any other of the Primates except Hylobates and Tarsius. As compared with that of the humerus, however, it is exceeded by the Semnopithecinæ, some of the lower Cebidæ, and by the Lemuroidea other than the Nycticebinæ. Its length exceeds that of the radius more in Man than in any other Primates except Hapale and Tarsius.

Its length, as compared with that of the femur, is less in Man than in any other Primate, though he is very closely approached by Troglodytes, Nycticebus, and Cynocephalus.

The tubercle of the tibia is at its maximum of distinctness in Man, and is placed higher up than in other Anthropoidea.

The articular surfaces for the condyles of the femur more completely occupy the upper surface of the tibia than in any other Primate; and in Man the outer of the two articular facets is generally more or less strongly concave antero-posteriorly.

The exceeding sharpness of the crest is absolutely peculiar to Man.

The ridge for the popliteus is more developed in him than in any other of the Anthropoidea, and in the fact that the posterior border of the articular surface of the astragalus descends further down than does the anterior margin of that surface, he differs from every other Primate.

In the *Fibula* the peroneal malleolus is not produced out into a strong process as in other Anthropoidea, but it descends much further down than does the tibial one, by which character Man differs from all the rest of the Order. The fibula of Man is excavated and ridged in a degree existing very rarely, if ever, in other Primates.

Pes.—The absolute length of this segment of the skeleton of Man is exceeded only by that of the same part in the Gorilla and Orang.

Its length, in proportion to that of the spine, is exceeded by that of all other Primates except Lemur, and (as far as I have been able to ascertain) the Nycticebinæ, and perhaps also some of the lower Simiidæ and Cebidæ. Man, however, more exceeds Arctocebus in this proportion than he is exceeded by the Gorilla.

Its length, as compared with that of the pelvic limb minus the pes, is less than in any other Primate, Hylobates and the Nycticebinæ, however, approaching him rather nearly in this respect.

The same is the case as regards the proportion borne by the pes to the tibia.

The antero-posterior plantar arch is, as has been before said, extensive and peculiar (from the fact of the hallux forming the fulcrum in standing and walking), the tuberosity of the calcis and the distal ends of the inner metatarsals resting on the ground; but, as has been pointed out already, even in Man the outer side of the tarsus and metatarsus is applied, in standing, to the supporting surface, while in many other Primates the inner side of the tarsus and metatarsus is more raised from the ground than in him. So that the distinction between Man and Apes, in this respect, is much less than is often supposed.

The tarsus is longer, in proportion to the spine, than in any other Primates except Cheiromys, Galago, and Tarsius, that of each of the two last exceeding Man's in relative length far more than his exceeds that of Arctocebus, which is the relatively shortest of the Order.

The length of the tarsus, compared with that of the whole pes, is greater in Man than in any other Primate except Galago, though it is very nearly equalled by that of Tarsius.

The os calcis appears to be longer, in proportion to the spine, than in any other Primate except the Gorilla and Ateles, Cheiromys, Galago, and Tarsius. That of Man is twice the relative length of that of the relatively shortest; but that of Tarsius is three times the relative length of that of Man.

The tuberosity of the os calcis is at its maximum breadth inferiorly, where it has two tubercles, and is thus peculiar.

The cuboides is absolutely longer than in any other Primate; and the distal articular surface of the entocuneiforme is strikingly and characteristically flatter than in any other species of the Order.

The absolute length of the hallux, both with and without its metatarsal, is greater than in any other Primate. It also differs from that of all other Primates in not being directed outwards at an angle to the other metatarsals.

The superior surface of the astragalus is almost perfectly horizontal.

The first phalanx of the hallux is slightly, and the second one considerably longer, absolutely, than in any other Primate.

The proportion borne by the hallux, with its metatarsal, to the pollex and also to the spine, as also that of its metatarsal to the latter, are all intermediate in the order; but the proportion of the hallux, with its metatarsal, to the longest digit of the foot, is greater in Man than in any other Primate.

The proportion of the hallux, with its metatarsal, to the whole pes is greater than in any other of the Primates except Indris, the Nycticebinæ, and sometimes Hylobates.

Without its metatarsal, its length, when compared with that of the pes, is decidedly exceeded by that in Arctocebus and perhaps Perodicticus, and slightly by that in the Chimpanzee, but by no other, though it is very nearly equalled by that in Loris and Indris.

The length of the third digit, without its metatarsal, compared with that of the pes, is far less in Man than in any other Primate; and the proportion of the longest digit, with its metatarsal, to the spine is less than in any other Primate except Arctocebus.

The first or the second digit is the longest of the pes, a condition existing in no other Primate.

The phalanges are shorter, as compared with the metatarsals, than in any other Primate, and are narrow and rounded inferiorly in a way found in no other.

The index is sometimes shorter than the hallux (compared without their metatarsals), a condition existing only in Man in the whole Order, though nearly approached in Arctocebus and Perodicticus.

The proportion of the longest digit of the foot to the longest one of the hand (metatarsal and metacarpal included) is less in Man than in any other of the Primates except the Chimpanzee, Hylobates, and Cheiromys.

The excess in length of the third digit of the manus over the third digit of the pes (without the metacarpal and metatarsal) is far greater in Man than in any other Primate except the Orang.

The distal ends of the metatarsals are small, and the vertical diameter predominates more over the transverse one than in the other Primates.

The successive shortening of the three divisions of the pes (tarsus, metatarsus, and digits) exists in Man alone of all Primates; also the great flattening of the plantar surface of the fifth metatarsal.

The proportion of the index to the spine is less than in any others of the Order except Perodicticus and Arctocebus.

The proportion borne by the second metatarsal to the pes is intermediate; that of the index of the foot to the index of the hand is less than in any other Primates except Troglodytes, Hylobates, and Tarsius.

That of the longest digit, without its metatarsal, to the longest metatarsal is much less than in any other Primate whatever: that of the same to the tarsus is also less than in any; but the proportion is approached by Galago, Tarsius, and the Gorilla.

The extent to which the hallux reaches with regard to the index is greater than in almost all, but is exceeded by that in Perodicticus and Arctocebus.

Thus the characters absolutely peculiar to Man, as compared with all the rest of the Primates, are—

1. The very inward aspect of the head of the humerus.
2. The radius being less than three-fourths the length of the humerus *.
3. The small relative distance between the anterior spinous processes of the ilium.
4. The large size of the acetabulum compared with the length of the os innominatum.
5. The small length of the os innominatum compared with the breadth of the pelvis.
6. The small distance between the inferior posterior spinous process of the ilium and the spine of the ischium, compared with that between the anterior inferior spinous process of the ilium and the symphysis pubis.
7. The fact that the length of the crest of the ilium (measured along its curves) about equals that of the os innominatum.
8. The strongly concavo-convex outer surface of the ilium, with marked gluteal lines.
9. The great concavity and inward direction of the iliac fossa.
10. The strongly marked concavity of the sciatic notches, and sharply projecting spine of the ischium.
11. The coexistence of small tuberosities, prolonged up nearly to the ischial spines, with a broad ilium.
12. The absolute length of the femur.

* Though, as far as I have seen, Man is the only Primate ever so conditioned, yet he does not appear to be invariably so. See above, note ‡, p. 311.

13. The angularity of the shaft of the femur, and strong projection of the linea aspera.

14. The predominance of that part of the rotular surface which is supported by the peroneal condyle.

15. The absolute length of the tibia.

16. The sharpness of the crest of the tibia.

17. The descent of the posterior border of the distal articular surface of the tibia (for the astragalus) below its anterior border.

18. The much greater descent of the peroneal than of the tibial malleolus.

19. The shortness of the pes compared with the length of the pelvic limb minus the pes, and compared with that of the tibia.

20. The great breadth of the lowest part of the tuberosity of the os calcis, and the presence of two tubercles on its plantar surface.

21. The flattened surface (for the hallux) of the entocuneiform bone.

22. The fact that either the first or the second digit is the longest and most projecting one of the pes.

23. The absolute size of the hallux, both with and without its metatarsal, and especially of its second phalanx.

24. The *very* slight outward direction of the first metatarsal.

25. The very obtuse angle (plantar one) formed by the transverse axis of the head of the first metatarsal, with a line passing transversely through the heads of the other metatarsals.

26. The great proportion borne by the hallux to the longest digit.

27. The small proportion borne by the four outer digits to the whole pes and to the metatarsals.

28. The very slight flattening of the plantar surfaces of the phalanges.

29. The narrowness and elevation of the distal ends of the four outer metatarsals.

30. The great flattening beneath of the outermost metatarsal.

31. The successive decrease in length of the tarsus, metatarsus, and digits.

32. The form and construction of the antero-posterior plantar arch.

Simia.

The Orang-outan, when compared with all the other Primates, presents the following notable conditions:—

The proportion borne by the pectoral limb to the spine is greater than in any other genera of the order except Tarsius and Hylobates.

The proportion of the length of the radius to that of the spine is greater than in any other except Hylobates.

The length of the index, with its metacarpal, compared with the spine, is greater than in any except Tarsius and Hylobates.

The length of the metacarpal of the pollex is greater, in proportion to that of the spine, than in any others except Hylobates and Tarsius.

The spine of the ischium is more largely developed than in any other Primate except Man.

The length of the pes is greater, in proportion to that of the spine, than in any except Ateles, Cheiromys, and Tarsius.

The proportion borne by the longest digit of the pes to the spine is greater than in any other Primate except Tarsius.

The length of the longest digit, without its metatarsal, compared with that of the tarsus, is greater than in any of the order except the Nycticebinæ and perhaps Indris.

In addition to these more or less exceptional conditions, the Orang differs from every other Primate without exception in:—

1. The great absolute length of the pectoral limb minus the manus.
2. The small length of the pelvic limb minus the pes, compared with that of the pectoral limb minus the manus.
3. The great absolute length of the manus.
4. The great absolute length of the third digit of the manus, both with and without its metacarpal.
5. The great absolute length of the metacarpal of the pollex.
6. The great difference between the length of the pollex and that of the index.
7. The large diameter of the acetabulum compared with the length of the spine.
8. The small proportion borne by the femur to the humerus.
9. The very obtuse angle formed by the neck of the femur with its shaft.
10. The all but constant* absence of a pit for the ligamentum teres, on the head of the femur.
11. The shortness of the tibia compared with the humerus.
12. The length of the pes compared with that of the rest of the pelvic limb.
13. The length of the pes compared with that of the tibia.
14. The absolute length of the three middle metatarsals.
15. The absolute length of the longest digit with its metatarsal.
16. The very small proportion borne by the length of the hallux to that of the longest digit of the pes.
17. The occasional absence of the second digit of the hallux.
18. The great length of the index, with its metatarsal, compared with that of the spine.
19. The small length of the hallux (both with and without its metatarsal) compared with that of the whole pes.
20. The great length of the second digit, without its metatarsal, compared with that of the whole pes.
21. The very similar length of the indices of the pes and manus, both with and still more without, the metatarsal and metacarpal.
22. The shortness of the tarsus compared with the length of the pes.

* It is *occasionally* absent in the Gorilla, as has already been mentioned; but in the Orang I have only found it present in one out of fourteen skeletons examined, namely in the specimen No. 3 *i* in the Osteological Collection of the British Museum. For this and other details concerning the appendicular skeleton of Simia, see Trans. Zool. Soc. vol. vi. p. 165, and pls. 25–43, especially pl. 40. fig. 7 *i*.

Hapale.

This genus has the pectoral limb, without the manus, shorter in proportion to the spine than it is in any other of the Anthropoidea.

The same remark applies to the pelvic limb minus the pes; and even with the latter it is shorter, as compared with the spine, than in any of the Primates, except Lemur and some of the Nycticebinæ.

The limbs are the shortest and smallest found in the Anthropoidea.

The proportion of the length of the clavicle to that of the scapula is less than in any other of the Primates except Tarsius.

The length of the humerus, compared with that of the spine, is less than in any except Indris, Lemur, Perodicticus, and Arctocebus.

The length of the manus about equals that of the radius, a proportion greater than in any of the Lemuridæ or other of the Anthropoidea except Brachyurus.

The proportion of the pollex to the longest digit is greater than in any other of the Anthropoidea (unless perhaps sometimes in Man) or Lemuroidea, except Arctocebus, Cheiromys, and perhaps Loris. The proportion of the pollex (without its metacarpal) to the whole length of the manus is greater than any other Primate that I have measured except Arctocebus.

The length of the femur, compared with that of the spine, is less than in any of the order except Perodicticus and Arctocebus.

The femur differs from that of the other Anthropoidea by its very short neck and the wide flat space between the trochanters behind (Plate XIII. fig. 5), thus approaching the Lemuroidea.

The proportion borne by the length of the tibia to that of the humerus is about as in Cheiromys, and greater than in any except Indris, Galago, and Tarsius.

The length of the pes, compared with that of the rest of the pelvic limb, is greater than in any except Galago, Tarsius, Cheiromys, Simia, and perhaps Nyctipithecus.

The proportion borne by the hallux to the spine is less than in any other of the Primates except Colobus.

That of its metatarsal to the spine is less than in any except Perodicticus and Arctocebus.

The length of the hallux, compared with that of the pollex, is less than in any other genus except Simia.

The excess, in length, of the longest digit of the pes over that of the manus is greater than in any other of the Primates measured by me except Chrysothrix and Loris*.

The length of the tarsus, compared with that of the pes, is less than in any genera of the order except Indris, Hylobates, Ateles, and Simia.

The length of the longest digit (without its metatarsal), compared with that of the longest metatarsal, is less than in any except Man and some of the lower Simiidæ.

* I have not been able to ascertain the proportion existing in Callithrix, Brachyurus, and Nycticebus.

Hapale differs from all other Primates in—

1. The small length of the radius compared with that of the spine.
2. The small length of the os innominatum compared with that of the scapula.
3. The degree to which the tibia sometimes exceeds the femur in length.
4. The laterally compressed ultimate phalanges of all the digits except the hallux.

Indris.

This remarkable Lemuroid has the whole hind limb, when compared with the whole fore limb, longer than in any other Primate * except Galago; and this is still more marked when the pelvic limb minus the pes is compared with the pectoral one minus the manus †.

The proportion borne by the length of the humerus to that of the spine is less than in any other of the Primates except Perodicticus and Lemur.

The length of the radius is greater, as compared with that of the humerus, than in any other Primate except Tarsius. That of the manus is to the rest of the pectoral limb greater than in any other except Cheiromys.

The length of the os innominatum, as compared with that of the femur, is less than in any other Primate except Tarsius.

That of the femur, compared with that of the humerus, is greater than in any other except Tarsius.

The same is the case as regards the tibia.

The proportion borne by the hallux to the spine is greater than in any other of the Primates except Tarsius, Cheiromys, sometimes Hylobates, and perhaps Ateles. The same is the case as regards its metatarsal.

The length of the hallux, as compared with that of the longest digit of the pes, is greater than in any Primate except the Chimpanzee, Arctocebus, and Man.

The proportion of the hallux to the pollex is greater than in any other Primate (in which the pollex has two phalanges) except Loris.

The length of the hallux (with its metatarsal), compared with that of the pes, is greater than in any other Primate except perhaps Arctocebus.

The proportion borne by the third digit (without its metatarsal) to the pes is greater than in any other Primates except Loris and Cheiromys; but Hylobates comes very near.

Indris differs from all other Primates in—

1. The dorsal portion of the groove near the axillary margin of the scapula.
2. The great relative size of the posterior inferior (in Man inferior anterior) spinous process of the ilium.

* Excluding, of course, Propithecus and other forms, the skeletons of which I have had no opportunity of examining.

† The great difference as to length between the arm and the leg in this genus is noticed in 'Man's Place in Nature,' pp. 72 & 73.

3. The degree to which the head of the femur is bent forwards.

4. The presence of a tubercle, projecting downwards on the tibia, beneath the pit for the semi-membranosus.

Loris.

In this genus the humerus is longer, in proportion to the spine, than in any other Lemuroid, and longer, in proportion to the scapula, than in any others of the Primates except Ateles and Hylobates, which two genera alone have the shaft narrower, in proportion to its length, than in Loris.

The radius exceeds the humerus more than in any others except Tarsius, the Indrisinæ, and sometimes Cynocephalus and Hylobates.

The manus, as compared with the spine, is shorter than in any other Primates except Chrysothrix and Arctocebus.

The proportion borne by the longest digit to the spine is less than in any other Primate except Arctocebus.

The proportion of the index to the spine is less than in any except Perodicticus and Arctocebus *; as also is that of the metacarpal of the index to that of the pollex.

The length of the pollex, as compared with that of the longest digit, is greater than in any others except Hapale, Arctocebus, Cheiromys, and perhaps Man.

The length of the third metacarpal, compared with that of the whole manus, is less than in any others except Brachyurus and Arctocebus.

The pubic symphysis, as compared with the length of the spine, is shorter than in any other Primate except Perodicticus.

The tuberosity of the ischium is more prolonged upwards and forwards towards the spine of the ischium (Plate XIII. fig. 3) than in any other Primate except Man.

The proportion of the length of the femur to that of the humerus is less than in any other Primates (other than the Simiinæ) except Ateles, Lagothrix, and Mycetes.

The length of the pes in proportion to that of the rest of the hind limb and of the tibia is less than in any other Primate except Man and Hylobates. The same in proportion to that of the spine is less than in any other Primate except Lemur and Arctocebus.

The os calcis is shorter, compared with the spine, than in any other genera except Arctocebus and Perodicticus; but the cuboid is longer, as compared with the os calcis, than in any other Primate except sometimes Hylobates.

The proportion borne by the hallux to the pollex is greater than in any other Primates except Colobus and Ateles.

The index of the pes more exceeds that of the manus in length than in any other genera of the order except Perodicticus and Arctocebus.

The length of the hallux, with its metatarsal, compared with that of the pes, is greater than in any other Primates except Indris and Arctocebus, and perhaps (?) Perodicticus.

Without its metatarsal, and so compared, it exceeds all except the same last-mentioned genera, the Chimpanzee, and Man.

* I have not been able to ascertain the proportion in Nycticebus.

Loris differs from every other Primate in—

1. The very cylindrical shape of the radius and ulna.
2. The shortness of the manus to the rest of the pectoral limb.
3. The shortness of the manus to the radius.
4. The exceeding smallness of the ilio-pubic angle.
5. The narrowness of the pelvis compared with its conjugate diameter.
6. The large relative size of the body of the pubis.
7. The extent to which the vertical diameter of the posterior outlet of the pelvis exceeds its transverse diameter.
8. The very small absolute length of the symphysis pubis.
9. The coexistence of small tuberosities (prolonged up nearly to the spines of the ischium) with a narrow ilium.
10. The small breadth of the true pelvis compared with the length of the os innominatum.
11. The closeness of the tibial trochanter to the head of the femur.
12. The extent to which the longest digit of the foot exceeds that of the hand.
13. The large extent to which the pollex exceeds a hallux with two phalanges.
14. The great length of the third digit (without its metatarsal) compared with that of the whole pes.
15. The length of the longest digit (without its metatarsal) compared with that of the tarsus.

Tarsius.

This highly interesting form, which perhaps stands lowest in the order*, presents many peculiarities.

The length of the entire pectoral limb, when compared with that of the spine, is greater than in any other genus of the order except Hylobates; and the same is the case with regard to the pectoral limb minus the manus (in the specimens examined by me), though Ateles and Simia come very close to Tarsius in this proportion. The proportion borne by the length of the scapula to that of the spine is greater than in any except the Simiinæ.

Similarly compared, the radius exceeds that of all except the Simiinæ and Ateles, and the manus is longer than in any except perhaps Cheiromys; and the last named is, moreover, the only genus in which the manus is yet more in excess of the radius in length.

The length of the first phalanx of the third digit, compared with that of its metacarpal, is greater than in any other Primate except Cheiromys; and its length, as compared with that of the manus, is about the same as in that genus, and greater than in any other.

I have found the ilio-pubic angle smaller than in any other Primate except Loris.

The length of the os innominatum, compared with that of the spine, is greater than in any other Primate except the Simiinæ, Cynocephalus, and Ateles.

* It has been suggested to me by Dr. Peters that Tarsius is a lower form than Cheiromys.

The proportion borne by the pes to the rest of the pelvic limb is greater than in any except Cheiromys and Simia; that borne by it to the tibia is greater than in any except the two last-mentioned genera and Galago.

The longest digit of the pes is shorter, in proportion to that of the manus, than in any other Primates except Man, the Simiinæ, and Cheiromys.

The index of the pes is shorter, as compared with that of the manus, than in any other member of the order except sometimes Hylobates.

The proportion borne by the index of the pes to the spine is greater than in any other genera except Hylobates, Cheiromys, Ateles, and Simia.

The length of the tarsus, compared with that of the entire pes, is greater than in any except Man and Galago.

The length of the third digit, without its metatarsal, compared with that of the pes, is less than in any other Primate except Man.

Tarsius differs absolutely from all other Primates in—

1. The whole pelvic limb being more than double the length of the spine.
2. The great length, compared with that of the spine, of the whole pelvic limb minus the pes.
3. The small proportion borne by the vertebral border of the scapula to its axillary border.
4. The shortness of the clavicle compared with the scapula.
5. The shortness of the humerus compared with the same.
6. The great length of the radius and ulna compared with that of the humerus.
7. The great length of the pollex (with its metacarpal) compared with that of the spine.
8. The great length of the longest digit (with its metacarpal) compared with the same.
9. The great length of the metacarpal of the pollex to the same.
10. The great length of the third digit (without its metacarpal) to that of the whole manus.
11. The difference in length of the ultimate and penultimate phalanges.
12. The shortness of the os innominatum compared with the femur.
13. The distance between the inferior (in Man anterior) spinous processes of the ilium compared with the length of the spine.
14. The same, compared with the length of the os innominatum.
15. The very great length of the femur compared with that of the spine.
16. The femur being more than double the length of the humerus.
17. The slenderness of the shaft of the femur, *i. e.* its transverse diameter compared with its length.
18. The narrowness of the femur at the condyles compared with the length of the bone.
19. The small extent of the free upward projection of the peroneal (great) trochanter compared with the same.
20. The great length of the tibia compared with that of the spine.

21. The great length of the same (more than double) compared with that of the humerus.

22. The great length of the same compared with that of the radius.

23. The narrowness of the proximal end of the tibia compared with the length of the bone.

24. The high position of the tubercle on the shaft of the tibia.

25. The anchylosis inferiorly of the tibia and fibula.

26. The great length of the whole pes compared with that of the spine.

27. The great length of the tarsus compared with the same.

28. The small breadth of the tarsus compared with its length.

29. The great length of the os calcis compared with that of the spine.

30. The very small length of the cuboid compared with that of the os calcis.

31. The great length of the hallux compared with that of the spine.

32. The great length of its metatarsal similarly compared.

33. The longest digit equalling very nearly half the length of the spine.

34. The shortness of the second metatarsal when compared with the length of the whole pes.

35. The shortness of the third digit (without its metatarsal) compared with the same.

Cheiromys.

This aberrant form, the close affinity of which to the other Lemuroids has been lately placed beyond the possibility of dispute *, differs from all the rest of the order except Tarsius, in the length of the manus compared with that of the spine; and I find the same to be the case with respect to the pollex, though here it is sometimes very closely approached, if not equalled, by Hylobates.

The longest digit, with its metacarpal, is also longer, when compared with the spine, than in any except Tarsius.

The index is longer, compared with the spine, than in any other Primates except Tarsius, Simia, and Hylobates.

The first phalanx of the third digit is longer, in proportion to the length of the manus, than in any other Primate except Tarsius.

The length of the tibia, compared with that of the spine, is greater than in any others of the order except Man, Hylobates, Ateles, and Tarsius; its length, compared with that of the humerus, is only exceeded by Hapale, Galago, Indris, and Tarsius; and compared with that of the radius, by Man, Callithrix, Hapale, and Tarsius.

The proportion of the tibia to the femur is greater than in any other Primate except Hapale.

The length of the pes, compared with the rest of the pelvic limb, is greater than in any other Primate except Simia.

* See the very excellent memoir on Cheiromys by Professor Peters, 'Abhandlungen der Königl. Akademie der Wissenschaften zu Berlin,' 1865.

The same, compared with that of the spine, is only exceeded by Tarsius, unless it may be sometimes also by Simia.

Compared with that of the manus, it is less than in any except Hylobates.

Compared with the tibia, it is longer than in any except Simia.

The cuboid bone is longer, in proportion to the os calcis, than in any except Man, Hylobates, Nyctipithecus, Hapale, Lemur, and the Nycticebinæ.

The proportion of the hallux, with its metatarsal, to the spine is greater than in any other except Tarsius, and sometimes Hylobates.

The proportions of the longest digit, and of the metatarsal of the hallux to the spine, are greater; the first than in any genus of the order except Tarsius and Simia, and perhaps Ateles; the second than in any except Tarsius and Hylobates.

The proportion of the hallux to the pollex is less than in any others except Hylobates, Hapale, Simia, and Tarsius.

The length of the longest digit of the pes, compared with that of the manus, is less than in any except Hylobates and the Chimpanzee.

The third digit, without its metatarsal, when compared in length with the pes, I have only found exceeded by Loris*.

Cheiromys differs from absolutely every other Primate in—

1. The great length of the manus as compared with that of the rest of the pectoral limb.

2. The great breadth of the two ends of the humerus compared with the length of the bone.

3. The manus being more than once and a half the length of the radius.

4. The great predominance, in length, of the third metacarpal over the others.

5. The great excess, in length, of the first phalanx of the third digit over its metacarpal.

6. The length of the pollex as compared with that of the longest digit.

7. The slenderness of the third as compared with the other digits of the manus.

8. The length of the longest digit, without its metacarpal, compared with that of the longest metacarpal.

Thus Man is but one of several exceptional forms of the Primates; nor does it appear that the bony structure of his limbs presents more peculiarities of form and proportion than may be detected in that of Tarsius, if even so many.

Again, the differences in anatomical structure between the appendicular skeleton of Man and that of certain Apes is certainly less than that which exists between the same parts in other genera which are counted by followers of Cuvier as Quadrumana, and therefore cannot have an *ordinal* value.

As might have been anticipated, it is the os innominatum and foot which supply the great majority of the absolutely distinctive characters. But the pelvis of Man differs decidedly less from that of the Gorilla than does the latter from that of Loris;

* I have not been able to compare Brachyurus, Callithrix, Nycticebus, and Perodicticus.

and indeed the last differs from the pelvis of Indris as much perhaps as from that of Man, which it resembles as regards the tuberosities of the ischium.

So also the amount of difference in form and proportion between the parts forming the pes of Man and their homologues in the Gorilla is far less, as has been before abundantly demonstrated*, than that existing between the same parts in the Gorilla and Orang, *à fortiori*, than that which distinguishes the pes of the Gorilla from that of Tarsius!

Again, the hand of Cynocephalus is indeed like that of Man, when considered beside the manus of Ateles, Arctocebus, Tarsius, and Cheiromys!

Yet the differences which *do* exist between the appendicular skeleton of Man and that of all other Primates harmonize with his location in a distinct family.

This family is evidently one more closely allied to the Apes than to the Lemuroids; it is one belonging to the Anthropoidea, not to the Lemuroidea. Yet in certain points Man approximates to the latter group: thus the condition of the tuberosity of the ischium presented by him is most closely imitated by Loris; and in the small proportion borne by both the humerus and by the pelvis to the femur, Man resembles some or other of the Lemuroids. The same might be said as regards the length of the tarsus as compared with that of the spine; but this resemblance is only owing to the peculiar tarsal structure of Galago and Tarsius. In the small proportion borne by the index to the spine, however, and in the length of the hallux compared with the longest digit of the pes, Man is more nearly approached by some of the Lemuroids than by any of the Anthropoidea inferior to him. Man resembles some or other of the forms of his own suborder, however, in the absolute size of the limbs and of the several bones composing them; also in the well-marked anterior vertebral angle of the scapula and the sigmoid form of its vertebral margin; in the breadth of the glenoid cavity, the well-defined suprascapular notch, and the length of the clavicle as compared with that of the spine. Also in the inward direction of the head of the humerus he differs less from the highest Apes than from all the Lemuroidea; and he differs from the last and resembles the Anthropoidea in the great length of the humerus as compared with that of the spine, the moderate supinator ridge, the absence of the supracondyloid foramen, which is present in all Lemuroids except Arctocebus, but is, as we have seen, absent in the majority of the Anthropoidea.

Again, he approximates to some of the last-named group in the small proportion borne by the radius to the humerus, in the width of the greater sigmoid cavity of the ulna, and the indirect articulation of the latter with the carpus, in the small proportion borne by the first phalanx of the third digit to its metacarpal, in the width and internal concavity of the ilium, in the flattened horizontal ramus of the pubis, in the subpubic groove, and in the length of the femur compared with that of the spine, in which last Man is about equalled by Ateles†. Finally, he agrees with all the Anthropoidea, and differs from a greater or less number of the Lemuroidea in the ilio-pectineal

* Man's Place in Nature, p. 93.

† In Tarsius the femur is still longer relatively, but so much so as to diverge further from the human proportions by excess than does that of most Apes by defect.

line never forming the actual anterior margin of the ilium, in the small tibial trochanter, the rounded patella, the moderate concavity and elongation of the rotular surface.

On the whole, then, the family Hominidæ ranges itself side by side with the Simiidæ, Cebidæ, and Hapalidæ (*i. e.* judging from the appendicular skeleton only), though probably it is more distinct from them than they are from each other. But before considering the affinities of the various groups of Primates to each other, it is desirable to enumerate the more prominent characters which exist in the several divisions of the order. In endeavouring to collect such I have found considerable difficulty in obtaining characters to separate the two suborders; this has not been, however, on account of any great resemblance between them, but, as in the axial skeleton*, because of the great diversity of structure presented by the suborder Lemuroidea.

ANTHROPOIDEA.

Suprascapular notch often well defined, sometimes a foramen; humerus often without a supracondyloid foramen; os intermedium not interposed between the semilunare and the unciforme; pollex never reaching to the middle of the second phalanx of the index; index always with three phalanges; third digit almost always† projecting furthest, and being the longest; ilium often broad, its crest often much arched; ilio-pectineal line never forming the actual inferior (anterior) margin of the ilium; tuberosities of ischium often much expanded and flattened; shaft of femur often curved, convex forwards, a line drawn from the peroneal (great) trochanter to the condyles, almost always cutting its anterior surface; neck more or less elongated; tibial trochanter always less than the peroneal one; no third trochanter‡; pit for ligamentum teres not always present; patella more or less rounded; tibial malleolus never much incurved at its extremity; fibula always distinct from the tibia; distal articular surface of entocuneiforme never saddle-shaped; fourth digit of pes scarcely ever projecting most, or being the longest§; no proximal phalanx of any of the four outer digits exceeding in length its supporting metatarsal.

HOMINIDÆ.

The characters of Man have been given above, under the head of "Exceptional forms."

SIMIIDÆ.

Suprascapular notch not strongly marked; anterior vertebral angle mostly ill-defined; humerus without a supracondyloid foramen; pollex never reaching the middle of the proximal phalanx of the index; conjugate diameter of pelvis always exceeding the transverse; length of crest of ilium never nearly equalling that of the

* Proceedings of the Zool. Soc. 1865, p. 578. † Except in Pithecia.

‡ Except sometimes in Hylobates, *e. g.* No. 5026 in the Museum of the Royal College of Surgeons.

§ Except, again, in Pithecia, and also sometimes in Nyctipithecus. It sometimes projects most also in Hapale.

os innominatum; crest without a marked sigmoid curvature; inferior (in Man anterior) spinous processes of ilium little marked; symphysis pubis much elongated; tuberosities of ischium large, everted, and always distant from the spine of the ischium; sciatic notches never very concave; brim of pelvis never heart-shaped; linea aspera only moderately marked; rotular surface supported but little more by the peroneal condyle than by the tibial one; surface of tibia for the peroneal condyle convex anteroposteriorly; crest of tibia never very sharp; posterior border of articular surface for astragalus not descending below its anterior border; peroneal malleolus strongly projecting outwards, but only descending about as much as the tibial one; hallux never equalling three-fourths the length of the longest digit of pes; tuberosity of os calcis, with its long axis, always bent inwards below; distal articular surface of entocuneiforme convex; metatarsal of hallux with no articular surface for the metatarsal of the index; third digit of pes extending further forwards; phalanges of pes long, broad, and flattened or concave beneath, much like those of the manus; either pollex or hallux with two phalanges, but not always both with two.

SIMIINÆ.

Proportion of whole pectoral limb to spine, estimated at 100, from about 142 to about 220; pelvic limb always shorter than pectoral one; angle formed by the vertebral and axillary margins of the scapula, from about 22° to about 35°; spine of scapula not always extending to the vertebral margin; anterior vertebral angle well defined; spine not grooved behind (below) at its base; surface for *teres major* little marked: acromion as high as coracoid or higher; coracoid long; anterior margin of scapula less than, or not much more than half the length of, the axillary one; clavicle more than one-fifth of the length of the spine; humerus more than half of the length of the same; deltoid surface of humerus not much marked; external condyle projecting outwards; styloid process of ulna not so large as the distal end of the shaft of that bone; manus more than one-third of the length of the spine; ilium more or less largely expanded; tuberosity of ischium only sometimes flattened inferiorly; only profile of acetabulum, and not its cavity, visible when outer surface of ilium is looked at; femur shorter than humerus; outer condyle decidedly smaller than the inner one.

TROGLODYTES.

Length of whole pectoral limb less, or but little more than once and a half the length of the spine; angle of axillary margin of scapula, and its glenoid surface, about 120° to 125°; no os intermedium; os pisiforme large; cuneiforme not articulating directly with the ulna; length of os innominatum more than half of that of the spine; os calcis more than one-tenth of the length of the spine.

T. GORILLA.

Proportion of supraspinous fossa of scapula very large as compared with infraspinous fossa; spine not reaching to the vertebral margin of scapula; posterior vertebral angle

about 34°; angle formed by spine with the axillary border about 30°; supra- and infra-spinous fossæ about equal in breadth at the glenoidal end of the spine; sternal horizontal curve of clavicle almost obsolete; subacromial space scarcely at all concave; humerus when looked at in front, with the ulnar tuberosity hiding the neck of the bone; ulnar ridge of trochlea projecting very little below the capitellum; manus less than three-fourths of the length of the radius; iliac fossa strongly concave; a distinct subpubic groove; shaft of femur expanding gradually downwards; great trochanter not projecting at all, peronead beyond the shaft of the femur; trochanteric fossa very shallow; sometimes no depression for the ligamentum teres; external condyle projecting back much less than the internal one; surface above the inner condyle not prominent; inner surface of malleolus not nearly at right angles with the distal articular surface of the tibia; length of hallux, without the metatarsal, less than one-fifth of that of the pes; tuberosity of calcaneum at its maximum of relative length, and produced only downwards (Plate XIII. fig. 6); astragalus at its minimum of length to breadth (Plate XIII. fig. 7); surface for tibial malleolus nearly on a level with the top of the astragalus; tarsus largely exceeding metatarsus in length; hallux reaching the distal end of the proximal phalanx of the index.

T. NIGER.

Proportion of supraspinous fossa of scapula only moderate as compared with infraspinous fossa; spine reaching quite or almost to vertebral margin, and sometimes ending nearer to the anterior than to the posterior end of the latter; posterior vertebral angle only about 22°; angle formed by spine with axillary margin about 20° or 24°; supraspinous fossa much wider than the infraspinous one at the glenoidal end of the spine; sternal horizontal curve of clavicle rather marked; subacromial space decidedly concave; ulnar tuberosity not hiding the neck of the humerus when the bone is looked at in front; ulnar ridge of the trochlea projecting much below capitellum; manus more than three-fourths of the length of the radius; iliac fossa *very* slightly concave, or not at all so; no subpubic groove; shaft of femur expanding suddenly at the condyles; great trochanter projecting slightly peronead beyond the shaft of the femur; trochanteric fossa very deep; pit for the ligamentum teres constantly present; condyles projecting backwards not very unequally; surface above the inner condyle prominent; inner surface of malleolus nearly at right angles with the distal articular surface of tibia; length of hallux, without the metatarsal, one-fifth of that of the pes, or more; tuberosity of calcaneum concave behind, and produced both upwards and downwards; surface for tibial malleolus forming a decided angle with upper surface of astragalus; hallux reaching a little beyond the proximal end of the second phalanx of the index.

SIMIA.

The main characters of this genus have been already given among "Exceptional forms."

HYLOBATES.

Pectoral limb about twice the length of the spine; entire pelvic limb scarcely more than three-fourths of the length of the pectoral one; angle of spine of scapula, with axillary margin, about 12° or 15°; angle of glenoid surface, with the same, about from 93° to 105°; proportion of supra- to infraspinous fossa very large; spine ending considerably nearer the posterior than the anterior end of the vertebral margin, which margin, however, it scarcely attains; axillary margin nearly straight; supraspinous fossa largely exceeding the infraspinous one at the glenoidal end of the spine; glenoid surface rounded and shallow; clavicle more than one-quarter the length of the spine; acromial horizontal curve of clavicle almost obsolete; humerus somewhere about three-fourths of the length of the spine, and approaching three times that of the scapula; head of humerus very globular; tuberosities very small, and much below the summit of the head of the humerus; radius more than four-fifths of the length of the spine; metacarpal of pollex about one-tenth of the length of the spine; an os intermedium; cuneiforme articulating directly with the ulna; metacarpals increasing markedly (in length and in extension distad) from the fifth to the second; pisiforme long but slender; trapezium with a rounded convex articular surface for metacarpal of pollex; ilio-pectineal eminence very large; subpubic groove generally distinct; symphysis pubis very long; tuberosities of ischium large and flattened beneath; shaft of femur very straight; trochanteric fossa deep; external condyle projecting back much less than the internal one; tibia more than half of the length of the spine; hallux reaching to the middle or more of the proximal phalanx of index; metatarsal of hallux more than one-tenth of the length of the spine.

SIMIIDÆ OTHER THAN THE SIMIINÆ.

Proportion of whole pectoral limb to spine, at 100, from about 91·7 to about 121·3; pelvic limb always longer than pectoral one; angle formed by the vertebral and axillary margins of the scapula from about 50° to about 75°; spine of scapula always reaching its vertebral margin; anterior vertebral angle not well defined; spine grooved behind at its base; surface for *teres major* much marked; acromion often not nearly so high as coracoid; coracoid very short and bent in towards glenoid surface (Plate XI. fig. 3); anterior margin of scapula much more than half of the length of the axillary margin (Plate XI. fig. 2); clavicle less than one-fifth of the length of the spine; humerus less than half of the length of the same; deltoid surface much marked (Plate XII. fig. 4); external condyle pressed forward and, as it were, flattened against capitellum; styloid process as large as, or larger than, the distal end of the shaft of the bone; manus less than one-third of the length of the spine; often a process extending backwards from the proximal end of the fifth metacarpal; an os intermedium; cuneiforme joining ulna directly; pisiforme large; crest of ilium short; no subpubic groove; tuberosity of ischium large and always flattened beneath; greater part of cavity of acetabulum visible when outside of ilium is looked at; femur longer than humerus; outer condyle of nearly the same size as the inner one; hallux always with two phalanges.

SEMNOPITHECINÆ.

Pollex sometimes only with one phalanx, and if with two, only reaching slightly beyond the base of the proximal phalanx of the index; hallux extending a little beyond the base of the proximal phalanx of the index of the pes.

CYNOPITHECINÆ.

Pollex always with two phalanges, and sometimes nearly reaching the middle of the proximal phalanx of the index; hallux nearly attaining the distal end of the proximal phalanx of the index of the pes.

There is great similarity in the limb-structure of all the Simiidæ other than the Simiinæ; and a series of gradual modifications leads from the form and proportions found in Semnopithecus to those existing in Cynocephalus.

CEBIDÆ AND HAPALIDÆ.

Pelvic limb always longer than the pectoral one, except sometimes in Ateles; posterior vertebral angle from about 30° to about 50°; anterior margin always more than half the axillary one, except in Ateles; spine ending in front of the middle of the vertebral margin of the scapula; suprascapular notch generally well defined, sometimes a foramen; supraspinous fossa much exceeding the infraspinous one at the glenoidal end of the scapula; clavicle with a sigmoid curvature; external condyle of humerus very small, and more or less confounded with capitellum; olecranal fossa shallow, imperforate; capitellum relatively very large; ulnar ridge of trochlea very little produced; styloid process of ulna very large; ridge for *pronator quadratus* often much marked; proportion of pollex, without metacarpal, to manus always greater than in the Simiidæ (except of course in Ateles); pollex attaining distal end of proximal phalanx of index (except of course in Ateles); an os intermedium present; cuneiforme articulating directly with ulna; only a very small process projecting back from the proximal end of the fifth metacarpal; ilium never much expanded; iliac fossa very narrow and never strongly concave; brim of pelvis never heart-shaped; conjugate diameter of pelvis always exceeding the transverse one; length of crest of ilium never nearly equalling that of the os innominatum, and without any sigmoid curvature; spinous process of ilium little marked; tuberosities of ischium never broad and flattened beneath, but distant from spine of ischium; sciatic notches very slightly concave; greater part of cavity of acetabulum visible when the outside of the ilium is looked at; trochanteric fossa deep; linea aspera little marked; no third trochanter; rotular surface but little more on the peroneal condyle than on the tibial one; surface of tibia for peroneal condyle more or less convex antero-posteriorly; crest of tibia never very sharp; posterior border of articular surface for astragalus not descending below its anterior border; peroneal malleolus strongly projecting outwards, but not descending further than the tibial one; hallux never much exceeding half the length of the longest digit, metatarsals included; tuberosity of os calcis with its long axis always bent inwards below; entocuneiforme with its distal

articular surface convex; metatarsal of hallux with no articular surface for metatarsal of index; third digit of pes almost always the one extending furthest forwards, if not the third, then the fourth; phalanges of pes long, broad, and flattened or concave beneath, much like those of the manus; hallux always with two phalanges.

CEBIDÆ.

Inner condyle of humerus generally produced downwards nearly to the level of the margin of the inner part of the trochlea; often a supracondyloid foramen; radius only one-fourth of the length of the spine; proportion of hallux, without its metatarsal, at 100, to pes, from about 18·4 to 20·1; hallux reaching from the middle to the distal end of the proximal phalanx of the index; ultimate phalanges never laterally compressed, sharply curved and pointed.

ATELES.

Pelvic limb sometimes shorter than the pectoral one; proportion of pectoral limb to spine greater than in any other Cebidæ, or than in any Lemuridæ or lower Simiidæ; proportion of pelvic limb to spine greater than in any other Anthropoidea except Hylobates; length of scapula to spine greater than in any other of the Anthropoidea except the Simiinæ; its anterior border less than half of the length of its axillary border; angle of glenoid surface, with axillary margin, about 110°; posterior vertebral angle about 30°; proportion of the supraspinous fossa to the infraspinous fossa very large; spine not quite reaching the vertebral margin; a suprascapular foramen; surface for *teres major* not projecting; acromion very long and narrow; clavicle nearly a fifth of the length of the spine; tubercle for trapezoid ligament very marked; humerus more than half of the length of the spine; tuberosities small and decidedly below the head of the humerus; no supracondyloid foramen; ulnar ridge of trochlea very small and not descending below the inner condyle; medullary foramen of humerus opening at the end of a long groove; styloid process of ulna enormous; medullary foramen of radius often directed distad; manus nearly half of the length of the spine; pollex often less than one-tenth of the length of the same; proportion of metacarpal of pollex to spine sometimes greater than in any other of the Cebidæ or Hapalidæ; pollex often with only one phalanx; pisiforme small; trapezium with no distal concavity; crest of ilium much arched, concave outwards; tuberosity of ischium very small; acetabulum very shallow; peroneal trochanter small, not so high as head of femur; peroneal trochanter not projecting peronead beyond shaft; pit for ligamentum teres very large; outer condyle much smaller than the inner one; pes exceeding half the length of the spine; pes shorter in proportion to the manus than in any other Primates except the Simiinæ and Cheiromys; hallux much more than twice and a half the length of the pollex.

LAGOTHRIX.

Pelvic limb slightly longer than pectoral one; pectoral limb more than once and a quarter the length of the spine; proportion of supra- to infraspinous fossa even

greater than in Ateles; anterior margin much more than half the length of the axillary one, and with a deep notch sometimes converted into a foramen; spine at its glenoidal end coming close to axillary border; clavicle nearly one-fifth of the length of the spine; tuberosities of humerus small and decidedly below its head; no supracondyloid foramen; pollex always with two phalanges; tuberosity of ischium approaching slightly nearer to the spine of the ischium than in Ateles (Plate XIII. fig. 1); peroneal trochanter larger than in that genus, and rising above the summit of the head; pit for ligamentum teres of moderate size; outer condyle much smaller than the inner one; hallux not reaching quite so far forwards, with regard to the index of the pes, as does the pollex with respect to that of the manus.

CEBUS.

Scapula much like that of the lower Simiidæ, but trapezoid ridge very prominent and sharply defining the suprascapular notch; spine transverse and grooved behind at its base; spine at its glenoidal end coming close to axillary margin; surface for *teres major* very prominent; clavicle much less than one-fifth of the length of the spine; sternal horizontal curve of clavicle less marked than in Lagothrix and Ateles; tuberosities of humerus almost rising to a level with the summit of its head; bicipital groove and deltoid surface very marked; a distinct supracondyloid foramen; radius and ulna much curved; styloid process of ulna long, but not like that of Ateles; pisiforme large; trapezium sometimes with a very slight distal concavity; tuberosity of ischium rounded; anterior inferior (superior anterior) spinous process of ilium disguised by the projection of the anterior (superior) end of the ilio-pectineal line; peroneal trochanter well developed, pointed, and projecting peronead beyond the shaft of the femur; condyles approaching, but not attaining the equality existing in those of the lower Simiidæ.

MYCETES.

Proportion of the supraspinous fossa to the infraspinous one greater than in any other of the Anthropoidea except the Gorilla; a peculiar process projecting forwards from the anterior margin of the suprascapular foramen (Plate XI. fig. 4 *x*); spine flattened at its upper (posterior) end; subscapular fossa crossed by very strong ridges; clavicle remarkably and exceptionally slender (Plate XII. fig. 3); tuberosities of humerus very much below its head; no supracondyloid foramen; inner condyle descending as low as the inner margin of the trochlea; olecranal fossa shallow, imperforate; ridge on ulna, for *pronator quadratus*, very strongly marked; pisiforme large, and expanded at its distal end; anterior inferior (superior anterior) spinous process of the ilium distinct from that process which is the prolongation forwards (upwards) of the ilio-pectineal line; ilio-pectineal eminence sometimes a very prominent process; a more or less marked subpubic groove; shaft of femur expanding very gradually downwards (Plate XIII. fig. 4), and much antero-posteriorly compressed at its lower half; linea aspera represented by a wide groove with very distinct lips; trochanteric fossa deep; peroneal trochanter

not rising to the level of the top of the head of femur, and projecting *very* slightly peronead beyond the shaft; ridge for *gluteus maximus* very strongly marked; outer condyle much smaller than the inner one; patella rather long and narrow; hallux reaching nearly to the middle of the proximal phalanx of the index.

NYCTIPITHECUS.

Anterior margin of scapula strongly convex, and suprascapular notch well defined, but never replaced by a foramen; a supracondyloid foramen generally * present; condyles of femur nearly equal; proportion of pes to whole hind limb and to tibia greater than in any other of the Anthropoidea except Simia and Hapale; fourth digit of pes sometimes longest and most projecting.

CALLITHRIX.

Scapula with no projection for the *teres major*; no suprascapular foramen, but the notch sharply defined; a supracondyloid foramen; length of radius to spine less than in any other of the Anthropoidea except Hapale; condyles of femur about equal in size and production backwards.

CHRYSOTHRIX.

Proportion of pectoral limb to spine smaller than in any other of the Anthropoidea; anterior margin of scapula convex, and equalling four-fifths of the length of its axillary one; no suprascapular foramen; spine at its glenoidal end coming remarkably close to the same margin; surface for *teres major* very marked; suprascapular notch not well defined; manus scarcely more than a fifth of the length of the spine; length of pollex and of longest digit to spine less than in the other Cebidæ; femur only two-fifths of the length of the spine, and therefore relatively shorter than in any other Anthropoidea except Hapale; condyles rather unequal; pes shorter in proportion to spine than in any other of the Anthropoidea except Man, and sometimes Cynocephalus.

PITHECIA.

Supraspinous fossa very small when compared with the infraspinous one (Plate XI. fig. 5); anterior vertebral angle sometimes distinctly marked; suprascapular notch very little defined; a supracondyloid foramen; internal condyle not descending to the level of the inner margin of the trochlea; fourth digit the longest, and projecting most in both the manus and the pes.

BRACHYURUS.

Anterior vertebral angle of scapula not distinctly marked; suprascapular notch very little defined; a supracondyloid foramen; internal condyle descending as low as the inner margin of the trochlea; spine of ischium rather prominent from the inclination downwards (forwards) of the tuberosity of the ischium.

* In N. villosus (No. 58 B. in the British Museum) there is none.

HAPALIDÆ.

The peculiarities of this family have been mentioned amongst the "Exceptional forms."

LEMUROIDEA.

Spine of scapula ending anteriorly (superiorly) to the middle of the vertebral margin of the bone; suprascapular notch ill defined; glenoid surface narrow; clavicle never so much as one-fifth of the length of the spine; humerus never half the length of the same; internal condyle not descending so low as the edge of the inner margin of the trochlea; almost always a supracondyloid foramen *; supinator ridge almost always large and prominent; styloid process of ulna always articulating directly with the cuneiforme; intermedium generally present, and sometimes interposed between the semilunare and the unciforme; pollex sometimes reaching beyond the middle of the second phalanx of the index, which latter has sometimes only two phalanges; pollex always with two phalanges; fourth digit of manus almost always † the longest; ilium never very broad, or its crest much arched; ilio-pectineal line often forming the actual inferior (anterior) margin of the ilium; tuberosities of ischium never flattened beneath; no subpubic groove; sciatic notches very slightly concave; brim of pelvis never heart-shaped; conjugate diameter of pelvis always exceeding the transverse; a line drawn from the most anterior part of the peroneal trochanter to that of the condyles passing quite in front of the shaft of the femur; linea aspera faintly marked or absent; neck of femur *very* short; tibial trochanter sometimes larger than the peroneal one; often a third trochanter; pit for ligamentum teres constant; rotular surface but little more supported by the peroneal condyle than by the tibial condyle; patella often much elongated; inner malleolus often much incurved and compressed; fibula not quite always distinct from the tibia; peroneal malleolus not descending below the level of the tibial one; anterior border of articular surface of tibia for astragalus descending a little further than the posterior border; crest of tibia never very sharp; hallux sometimes equalling three-fourths of the length of the longest digit; tuberosity of calcis always inclined more or less inwards inferiorly; distal articular surface of entocuneiforme convex, and mostly saddle-shaped; hallux always with two phalanges; fourth digit of pes always longest and most projecting; phalanges of pes resembling much those of manus; proximal phalanges sometimes longer than their supporting metatarsals.

LEMURIDÆ.

Pectoral limb never more than slightly exceeding the length of the spine; pelvic limb, minus the pes, never so long as the spine; surface of scapula for teres major very slightly marked; coracoid process long; radius never half the length of the spine; manus never nearly attaining that proportion; manus never longer than radius; pollex, with its metacarpal, never one-fifth of the length of the spine; longest digit never attaining that proportion; fibula never anchylosed to tibia; hallux reaching to the middle of the second phalanx of the index, or beyond it.

* Always except in Arctocebus. † Always except in Tarsius.

LEMURIDÆ OTHER THAN THE NYCTICEBINÆ.

Pectoral limb always shorter than spine; anterior margin of scapula convex; clavicle often with only one horizontal curvature; great tuberosity of humerus as high as its head; supracondyloid foramen large and constant; olecranal fossa imperforate; intermedium present or absent; tuberosities of ischium never approaching very near its spine; posterior inferior (inferior anterior) spinous process of ilium well developed (Plate XIII. fig. 2, *sp*); condyles of femur unequal; head of femur not compressed; rotular surface deep, its margins very unequal; patella elongated; tibial malleolus opening from the side of the tibia; groove for tibialis posticus not extraordinarily marked; tarsus sometimes much elongated; naviculare more or less considerably enlarged antero-posteriorly.

INDRIS.

For this see above, "Exceptional forms."

MICRORHYNCHUS*.

Humerus with a strong sigmoid curvature, also supinator ridge; olecranon very small; ulna not diverging from radius so much as in Indris; pisiforme very small; no os intermedium; proportion of metacarpal of index to that of pollex as 183·3 to 100, or greater than in any other Lemuroid; tibia to radius as about 149·1 to 100, or almost the proportion of Man; fibula exceedingly slender; length of cuboid to os calcis as about 37·6 to 100; of naviculare to the same, about 38·9; naviculare expanding downwards but little.

LEMUR.

Pectoral limb scarcely more than three-fourths of the length of the spine; angle of spine of scapula with vertebral margin less than in the other Lemuridæ measured; supraspinous fossa very large as compared with the infraspinous one; margin of spine of scapula slightly bent over the infraspinous fossa; spine approaching very near to the axillary margin and glenoid surface; supraspinous fossa slightly exceeding the infraspinous one at the glenoidal end of the spine of the scapula; acromion remarkably flattened and concave externally, with a strong metacromion-like projection over the infraspinous fossa; clavicle sometimes less than a tenth of the length of the spine; shaft of humerus much curved; great tuberosity rising above the head of the humerus; supinator ridge exceedingly marked; radius sometimes only a quarter of the length of the spine; ridge on ulna for pronator quadratus very large; an os intermedium; fifth digit longer than index; ilio-pectineal line not forming the actual inferior (anterior) margin of the ilium; peroneal trochanter rising more or less above the head of the femur, and projecting very peronead beyond the shaft; trochanteric fossa small but deep; a third trochanter; peroneal condyle smaller than the tibial one; tarsus but little more than one-tenth of the length of

* For further details see Proc. Zool. Soc. 1866, p. 133. From the structure of the skull I have now no doubt but the *Propithecus diadema*, of Bennett, closely resembles *Indris brevicaudatus* in its appendicular skeleton. See Proc. Zool. Soc. 1867, p. 247.

the spine; cuboid nearly half the length of the os calcis; length of os calcis less than one-third of that of the tibia.

MICROCEBUS*.

Os calcis one-third of the length of the tibia.

GALAGO.

Entire pelvic limb more than once and a half the length of the entire pectoral one, both with and without manus and pes; angle of spine of scapula with its axillary margin less than in any other of the Primates measured, except Hylobates; supraspinous fossa nearly equal in size to the infraspinous one; spine of scapula approaching close to axillary margin and glenoid surface; clavicle considerably more than one-tenth of the length of the spine; shaft of humerus nearly straight; tuberosities not quite rising to the level of the top of the head of the bone; ilio-pectineal line forming the actual inferior (anterior) margin of the ilium; a small ilio-pectineal eminence; peroneal trochanter small, rising very slightly above the neck of the femur, but projecting much peronead beyond its shaft; a large third trochanter; trochanteric fossa very small; outer condyle extending back almost as much as the inner one; patella small, not much elongated; os calcis and naviculare very much elongated, the first being nearly one-fifth of the length of the spine; cuboides but very little more than one quarter of the length of the os calcis, which last is more than one-third of the length of the tibia; whole pes about half the length of the spine; pes more than once and a half the length of the manus; tarsus nearly one-fifth of the length of the spine.

NYCTICEBINÆ.

Pectoral limb sometimes longer than the spine; anterior vertebral angle well defined; spine ending not far from the posterior end of the first third of the vertebral margin, which margin it almost always reaches; infraspinous fossa more or less exceeding the supraspinous one near the glenoidal end of the spine (Plate XI. fig. 6); spine of the scapula not nearly approaching the axillary margin; no marked surface for the teres major; glenoid surface, as it were, twisted above (Plate XII. fig. 2); clavicle more than one-tenth of the length of the spine, with a more or less marked sigmoid curvature, and no acromial expansion; tuberosities of humerus always more or less below its head; supinator ridge slightly or strongly marked; supracondyloid foramen sometimes absent; olecranal fossa sometimes perforated; styloid process of ulna always exceedingly long, sometimes curved; os intermedium constant; pisiforme very small; sometimes an extra ossicle in transverse ligament of carpus; index digit sometimes at its minimum; tuberosities of ischium approaching near to the ischial spine (Plate XIII. fig. 3); posterior inferior (inferior anterior) spinous process absent or very minute; crest of ilium remarkably short; pelvis very narrow transversely; no pubic spine; ilio-pectineal line forming the actual inferior (anterior) margin of the ilium (Plate XIII. fig. 3); symphysis pubis

* For further details see Dr. Peter's 'Reise nach Mossambique,' p. 17.

generally *very* short; neck of femur all but obsolete; peroneal trochanter very small, sometimes smaller than the tibial one, which is always large; scarcely any distinct third trochanter; head of femur more or less compressed; rotular surface very shallow; tibia with a strongly marked process overhanging the fossa for the *tibialis anticus*; facet of tibia for outer condyle very convex antero-posteriorly; tibial malleolus pointed, curved, and compressed, and sometimes springing rather from the front than from the side of the tibia; groove for *flexor longus hallucis* very marked; groove for *flexor longus digitorum* separated from the others by a strong process; surface of tibia for astragalus with its long axis directed antero-posteriorly; patella small and rounded; os calcis less, or but little more, than one-twentieth of the length of the spine; tuberosity of os calcis small and much inflected; naviculare very short antero-posteriorly (Plate XIV. fig. 10); hallux reaching beyond the middle of the distal phalanx of the index.

LORIS.

For the characters of this genus see above, "Exceptional forms."

NYCTICEBUS.

Proportion of supra- to infraspinous fossa very small; anterior margin of scapula uniformly concave (Plate XI. fig. 6); a supracondyloid foramen; olecranal fossa imperforate; peroneal trochanter not rising so high as the summit of the head of the femur, which is extremely compressed; pit for ligamentum teres enormous; condyles projecting about equally backwards.

PERODICTICUS.

Posterior vertebral angle of scapula very obtuse (Plate XII. fig. 1); angle of spine of scapula with axillary margin very open; proportion of supra- to infraspinous fossa large; anterior margin of scapula with a slight prominence in its middle, otherwise straight; anterior vertebral angle very well defined; spine of scapula approaching axillary margin and glenoid surface more closely than in Loris; shaft of humerus much curved; a remarkably deep pit for the insertion of the *infraspinatus*; supinator ridge very strongly marked; external condyle, as it were, much extending the distal articular surface of the humerus; a large supracondyloid foramen; olecranal fossa imperforate; internal condyle large, truncated; an extra ossicle beneath (*i. e.* palmad to) carpus (Plate XIV. fig. 5), and another beneath tarsus; pollex much exceeding index in length, and reaching to the middle of the third digit; index with only two phalanges; tuberosity of ischium rather more everted than in Loris, and not approaching spine of ischium so nearly; peroneal trochanter projecting strongly forwards, and a little peronead beyond the shaft of the femur; tibial trochanter a wide flat process, sometimes larger than the peroneal one; only a faint impression of the ligamentum teres on femur; inner condyle projecting back more than the outer one; peroneal malleolus very large and massive; hallux attaining to nearly the middle of the distal phalanx of the index.

ARCTOCEBUS.

Proportion of supra- to the infraspinous fossa very large; free edge of spine of scapula much flattened; anterior margin of scapula with a convexity as in Loris; great tuberosity of humerus not rising to the level of the summit of its head; internal condyle prominent, but no supracondyloid foramen; index with only two phalanges; pollex reaching altogether beyond index and to ultimate phalanx of third digit, which third digit is remarkably short; peroneal trochanter very small, and not projecting peronead beyond the shaft of the femur; trochanteric fossa very small; tibial trochanter a large plate-like process, exceeding the peroneal trochanter in size; no third trochanter; hallux reaching to the end of the index digit of the pes.

TARSIIDÆ & CHEIROMYIDÆ.

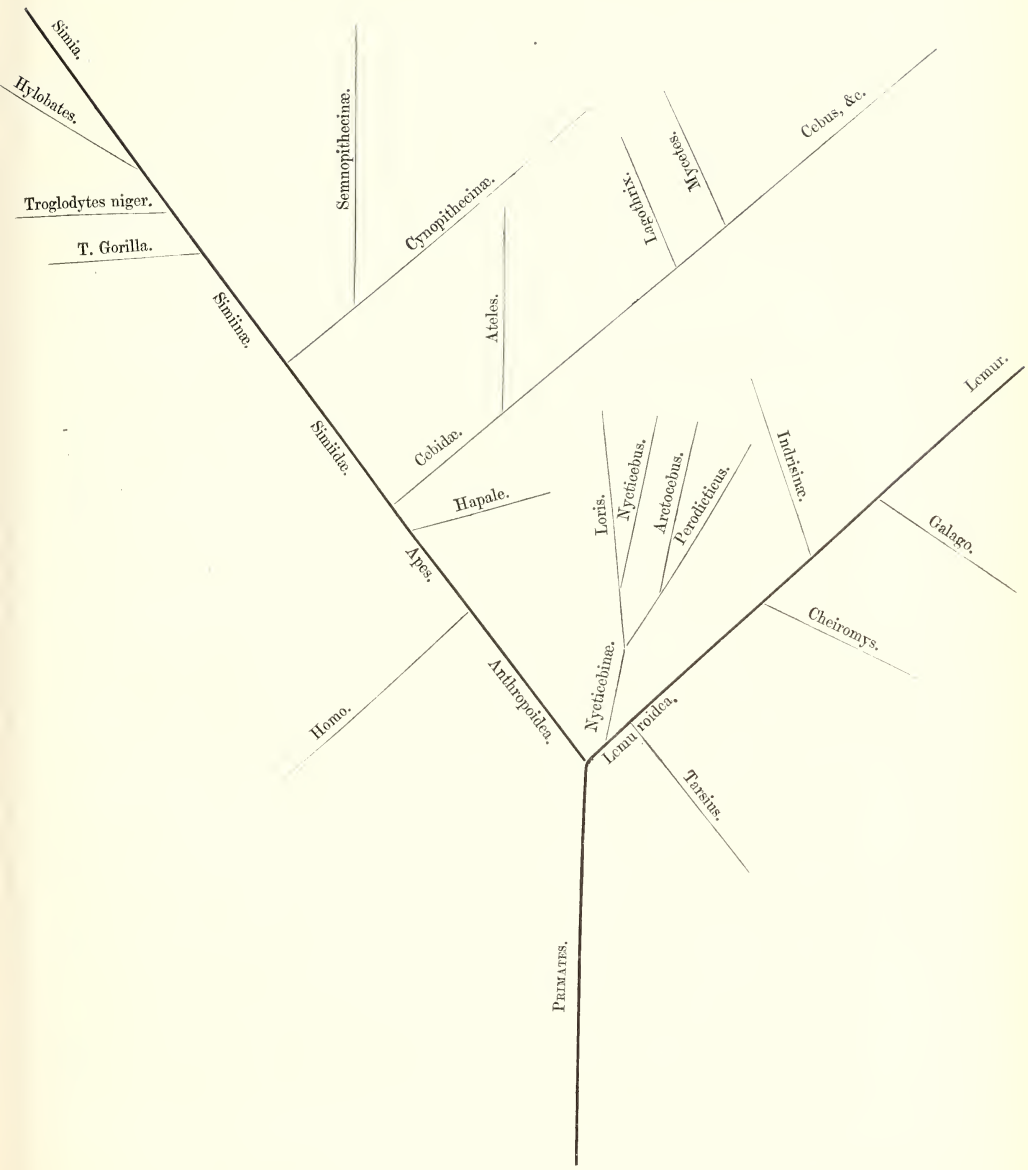
For the main peculiarities of these families see above, where they are the last two of the "Exceptional forms" given above.

To sum up the results of the foregoing observations, the Primates appear to present us (as regards their appendicular skeleton) with six principal types of structure, namely, (1) Homo, (2) Simia, (3) Cercopithecus, (4) Nycticebus, (5) Lemur, and (6) Tarsius. The first, however, has relations both with the third and fourth, some of the Nycticebinæ resembling Man more than all, or almost all, the other Primates in the proportion borne by the arm, without the manus, to the spine; in the proportion borne by the radius and ulna to the same; in the length of the pollex as compared with that of the longest digit; in the proportion borne by the tibia to the humerus and to the femur; in the length of the pes as compared with that of the tibia; in the marked anterior vertebral angle of the scapula; in the small supraspinous fossa; in the excess of the infraspinous fossa over the supraspinous one near the glenoid surface; in the short symphysis pubis; in the very peculiar tuberosity of the ischium. Moreover, one or more of the Nycticebinæ differ from the other Lemuroidea and approximate to Man in the greater or less degree of sigmoid curvature of the clavicle, and in the absence, in one genus, of the supracondyloid foramen in the humerus.

Besides the above six types, other forms show, as we have seen, more or less marked peculiarities; and perhaps the affinities between the various groups of the order (as regards the characters offered by their appendicular skeleton exclusively) may be fairly represented under the symbol of a tree. The trunk of such a tree divides into two main branches, for the Anthropoidea and Lemuroidea respectively.

The first main branch gives off a secondary one, which represents Man *, and then

* It should be borne in mind that this is only an attempt to express the degrees of resemblance existing amongst the appendicular skeletons of Primates, not the affinities indicated by their osteology generally, still less that evidenced by the totality of their organization. It is, in great part, the ossa innominata which cause Man to diverge so from the other Anthropoidea.


Simia.
Hylobates.
Troglodytes niger.
T. Gorilla.
Simiinæ.
Semnopitheciuæ.
Cynopitheciuæ.
Ateles.
Lagothrix.
Mycetes.
Cebus, &c.
Cebidæ.
Simiidæ.
Hapale.
Apes.
Homo.
Anthropoidea.
Loris.
Nycticebus.
Arctocebus.
Perodicticus.
Nycticebinæ.
Indrisinæ.
Lemur.
Galago.
Cheiromys.
Lemuroidea.
Tarsius.
Primates.

two other secondary branches for the American Apes. It then bifurcates to symbolize the Simiinæ and lower Simiidæ. The secondary branch for the Cebidæ gives off a very distinct twig to represent Ateles, and Lagothrix and Mycetes are also special forms. The secondary branch, standing for the lower Simiidæ, gives off a twig for the Semnopithecinæ, which is parallel to that for Ateles. That for the Simiinæ gives off twigs (for Troglodytes) which approximate in direction to that followed by the branch representing Man. It then gives off another twig (for Hylobates) and culminates in Simia.

The second main branch gives off, almost from its starting-point, and on the side next the higher Primates, a secondary branch to represent the Nycticebinæ. Some considerable distance higher up, on the same side, another twig stands for the Indrisinæ, while the branch itself culminates in Lemur, but gives off twigs for Galago and Cheiromys respectively, while almost from the base of its outer side, and diverging widely from the branches and twigs representing all other Primates, springs a twig symbolizing the very anomalous genus Tarsius; a form, as we have seen, as distinct in limb structure from the rest of the Order as is the genus Homo.

Thus the detailed examination of the appendicular skeleton of all Primates gives results not destitute of zoological value; but its main interest consists in the bearing it has upon the skeleton of Man, the characters of which can, I think, be more fully and correctly appreciated after such a comparison than when it is contrasted with that of the highest Apes alone.

Description of the Plates.

Where not otherwise stated, the figures are of the natural size.

PLATE XI.

Fig. 1. Scapula of an adult male Boschisman, from the skeleton No. 5357 in the collection of the Royal College of Surgeons.

This shows the remarkably convex superior (in all but Man anterior) margin.

Fig. 2. Scapula of Cynocephalus (No. 4731 in the same collection), showing the enormous convexity of the anterior margin and the prominence of the process for the trapezoid ligament; also the obtuse termination of the acromion.

Fig. 3. Front view of the glenoid surface of the same, showing its elongation, the small height attained by the acromion, the extreme shortness of the coracoid process (*a*), and the great relative length of that for the trapezoid ligament (*b*).

Fig. 4. Scapula of Mycetes, from the skeleton No. 4718 B. in the same collection.

This shows the peculiar process (*x*) in front of the suprascapular foramen; also the very large size of the supraspinous fossa, and the flattening of the margin of the spine.

Fig. 5. Scapula of Pithecia from the mounted specimen in the British Museum, showing the extremely small supraspinous fossa.

Fig. 6. Scapula of Nycticebus tardigradus, from the skeleton No. 4634 A. in the Museum of the College of Surgeons.

This shows the small size of the supraspinous fossa, the shortness of the acromion, and the concavity of the axillary margin.

PLATE XII.

Fig. 1. Scapula of Perodicticus, from a skeleton in the British Museum.

Here the supraspinous fossa is large, the vertebral margin very convex, and the axillary one concave.

Fig. 2. View of the glenoid surface of the same, showing the length of the coracoid process, and its divergence from the glenoid surface.

Fig. 3. Clavicle of Mycetes.

Fig. 4. Humerus of Cynocephalus, showing the strongly marked ridges, the great descent of the inner end of the trochlea (*t*), and the small projection of the external condyle; also the great thickness of the shaft, the considerable elevation of the great tuberosity, &c.

Fig. 5. Lower half of humerus of Mycetes, showing the descent of the inner condyle (*c*) to a level with the inner end of the trochlea (*t*).

Fig. 6. Humerus of Indris, showing the very prominent border of the bicipital groove, the large and truncated inner condyle, the slight projection of the inner margin of the trochlea, &c.

Fig. 7. Radius and ulna of Indris, showing the wide interval between the bones, their cylindrical form, small olecranon, &c.

PLATE XIII.

Fig. 1. Os innominatum of Lagothrix, from the skeleton No. A 4718 *a* in the Museum of the Royal College of Surgeons.

p. Subpubic groove.

The tuberosity of the ischium rather approaches the human form.

Fig. 2. Os innominatum of Indris, from the skeleton in the College of Surgeons Museum.

s p. The enormous posterior inferior (inferior anterior of Man) spinous process.

Fig. 3. Os innominatum of Loris gracilis, from the skeleton No. 4633 in the same collection.

This shows at *m* the ridge which runs obliquely outside the ilium, and which appears to answer to the anterior margin of Man; as also *s p* to his inferior anterior spinous process.

t i represents the singularly man-like tuberosity of the ischium.

Fig. 4. Femur of Mycetes (from the same skeleton as the scapula and clavicle were taken from), showing the very gradual increase downwards of the transverse diameter of the shaft, &c.

Fig. 5. Posterior surface of the upper part of the femur of Hapale, from the skeleton No. 4666 in the Museum of the College of Surgeons.

This shows the wide space between the trochanters behind.

Fig. 6. Outer surface of the os calcis of the Gorilla (5179 *a. q.* College of Surgeons), showing the deep groove outside it, and the very prolonged tuberosity, with the strongly marked inferior concavity of the bone.

Fig. 7. Astragalus of Gorilla (No. 5179 *a. r.* College of Surgeons).

This shows the great breadth and shortness of the bone, and the surface for the tibial malleolus (*t m*) almost in the same plane with the surface for the shaft of the tibia.

PLATE XIV.

Fig. 1. Dorsum of the carpus of the left manus of Troglodytes niger, from the specimen No. 5083 A. in the Museum of the Royal College of Surgeons.

In this the scaphoides (*sc.*) is large, and sends a marked process over the os magnum (*mg.*).

Fig. 2. The same view of the same part in the Orang (No. 5076 in the same Collection).

Here the scaphoides (*sc.*) and the intermedium (*i*) seem together evidently to answer to the scaphoides of the Chimpanzee.

Fig. 3. Trapezium of Troglodytes niger from the mounted detached manus in the Museum of the College of Surgeons.

In this there is no trace of a concavity for the metacarpal.

Fig. 4. Trapezium of Nycticebus tardigradus, from a specimen in my own collection. (Four times the size of nature.)

Fig. 5. Palmar surface of right carpus of Perodicticus, from the specimen in the British Museum.

Sc. Scaphoides. *l.* Lunare. *c. u.* Cuneiforme. *pi.* Pisiforme. *u.* Process of unciforme. *tz.* Trapezium. *x* Extra ossicle placed between the unciform process and the very large process of the trapezium.

A bristle is represented passing through the arch formed by the extra ossicle and these last-mentioned processes. (Twice the size of nature.)

Fig. 6 Distal surfaces of the human carpal bones.

Fig. 7 The same view of those of Macacus.

Fig. 8 Distal surfaces of the human tarsal bones.

Fig. 9. The same view of those of Macacus.

These five figures exhibit the correspondence between the angles formed by the articular surfaces in the manus and pes.

Fig. 10. Naviculare of Loris gracilis, from a specimen in my own collection.
C 1 & C 2, the prominences for the cuneiform bones. (Four times the size of nature.)

Fig. 11. Entocuneiforme of Gorilla.

Fig. 12. Entocuneiforme of Cynocephalus. (Twice the size of nature.)

Fig. 13. Entocuneiforme of Lemur, showing the saddle-shaped distal surface. (Twice the size of nature.)

Fig. 14. Proximal articular surface of the metatarsal of the hallux of Man.

Fig. 15. The same of the Gorilla.

Fig. 16. The same of Cynocephalus. (Twice the size of nature.)

Fig. 17. The same of Macacus. (Twice the size of nature.)

Fig. 18. The same of Lemur. (Twice the size of nature.)

These last five figures show the change in direction of the concavity of the articular surface from vertical, in Man, to horizontal in Lemur, that of the Gorilla being oblique.

Fig 1

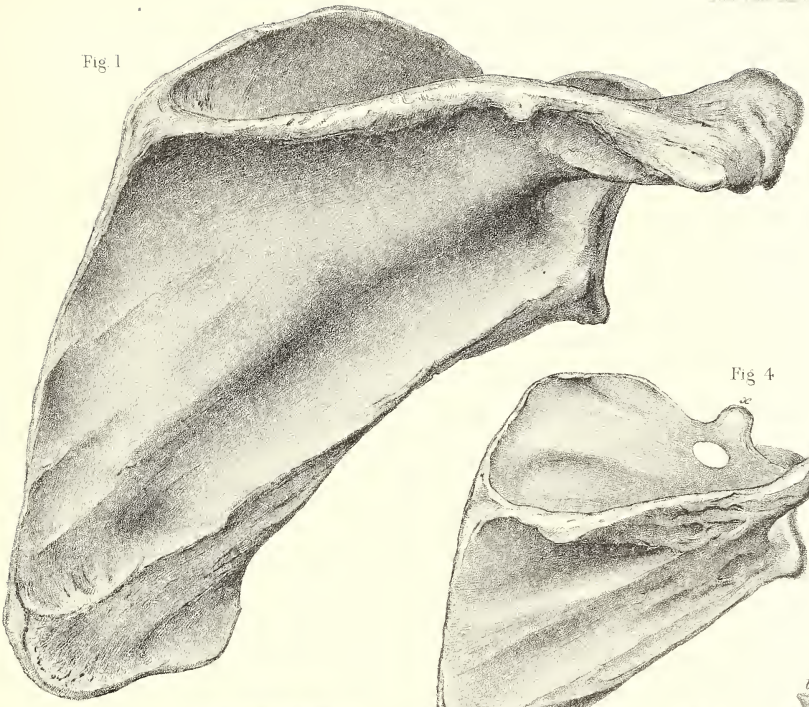


Fig 4

Fig 3.

Fig 2

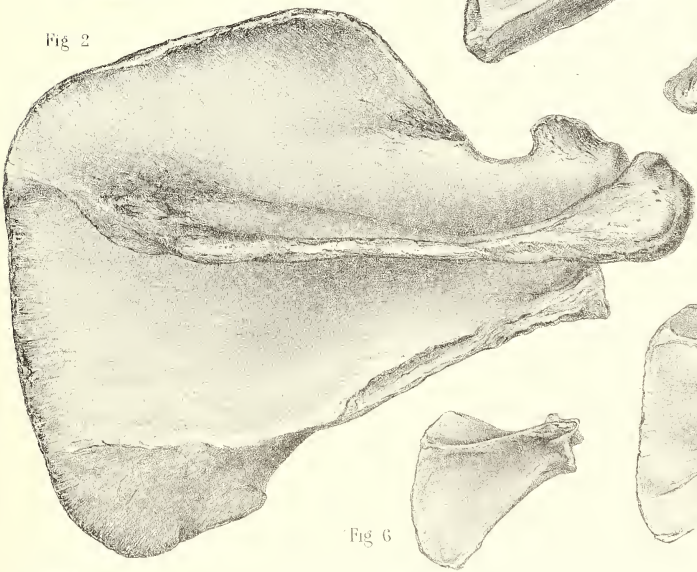


Fig 6

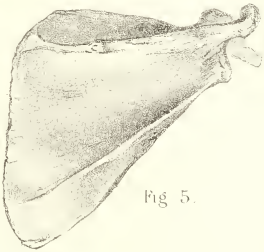


Fig 5.

W H Wesley del. & lith


BRIT
SEUM
NATURAL H
Y

Fig. 1.

Fig. 2.

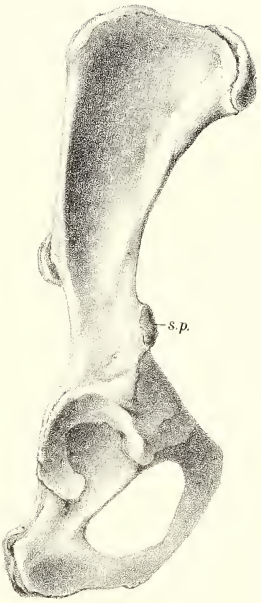


Fig. 3.

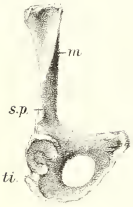


Fig. 4

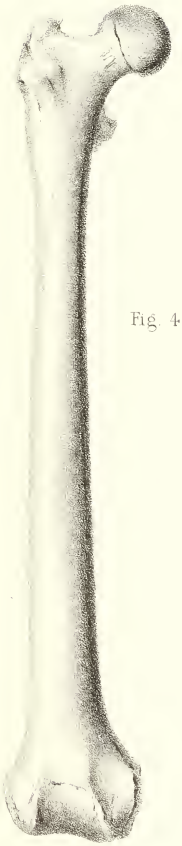
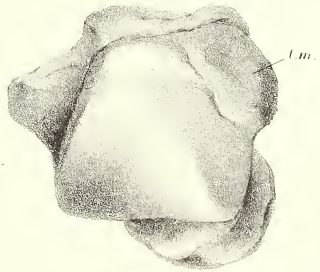


Fig. 5.

Fig. 7.



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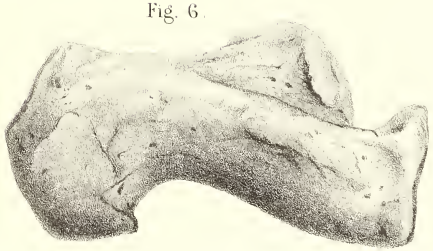



NATURAL

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

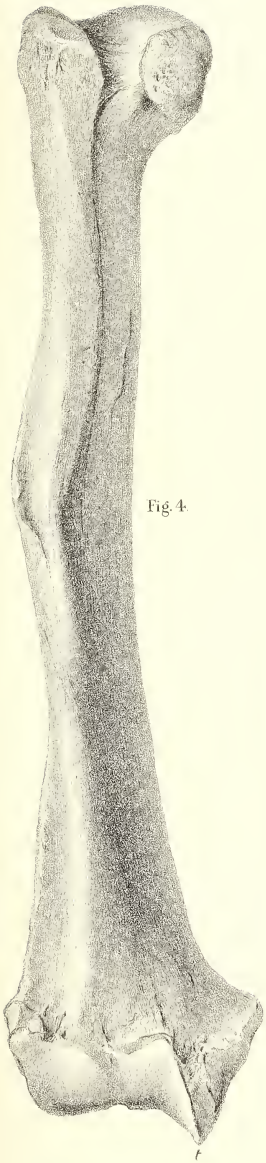


Fig. 7.

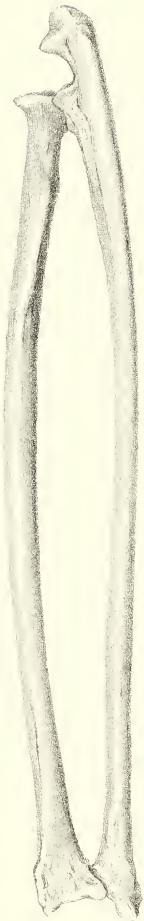
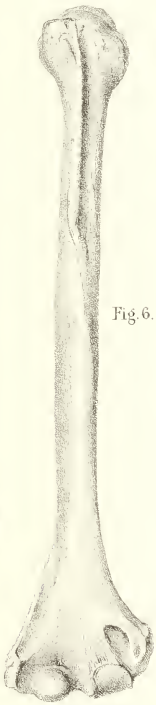


Fig. 5.

Fig. 6.




BRITISH
NATURAL HISTORY

Fig. 1.

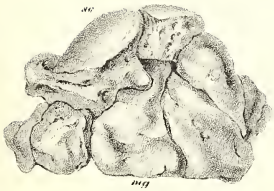


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 6.

Fig. 7.

Fig. 5.

Fig. 8.

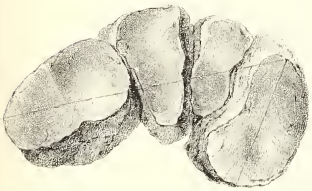


Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

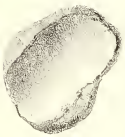
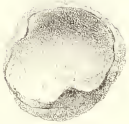


Fig. 16.

Fig. 17.



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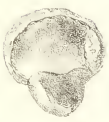

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