ON SOME POINTS IN THE ANATOMY OF THE CHIMPANZEE (*Anthropopithecus troglodytes*). By J. B. SUTTON, *Senior Demonstrator of Anatomy, Middlesex Hospital.*

In a paper communicated to the Zoological Society in 1835 "On the Osteology of the Chimpanzee and Orang Utan," Professor Owen writes as follows:—

"It has been no less a matter of surprise than of regret, that while the natural history of *Mammalia* which recede furthest from *Man*, and which inhabit the remotest regions, has been investigated with the most persevering and successful exertions, the species which are in immediate juxtaposition with him in his natural series should still remain almost as little understood as at the dawn of zoological science. We now, in fact, possess more accurate and detailed information respecting the economy and organisation of the paradoxical *Platypus* of Australia than we do with regard to the *Chimpanzee*, the most interesting of all the brute creation, from its close affinity to the human type of structure, which has long been known to inhabit the forests of Africa, and where there is every reason to believe that it is far from being rare."

At that time the censure was well deserved, but fortunately since that date anatomical literature has been enriched by careful and detailed descriptions of the dissections of numerous specimens of the Chimpanzee by the several anatomists into whose hands they have fallen.

The osteology of the creature has been principally discussed by Professor Owen in the paper already mentioned, and in his *Anatomy of Vertebrates.* Vrolik, of Amsterdam, published an excellent monograph in 1841, entitled "Recherches d'Anatomie Comparée sur le Chimpanzé." Dr Traill detailed certain facts concerning its myology as early as 1818, in the *Wernerian Transactions.* The *Boston Journal of Natural History* contains two papers on the muscles of the creature, one by Wyman, 1855, the other by Wilder, 1862. Duvernoy in the *Arch. des Museum,* tom. viii., 1855-6, "Des Caracteres Anatomiques des grands Singes pseudo-anthropomorphes," discusses at great length the anatomical characters of the Chimpanzee, Gorilla, Orang, and the Gibbons. Professor Humphry has described the *Arthrology* of this ape more in detail than any other writer in *Jour. of Anat.*, 1867, vol. i. Macalister noted certain points in the creature's myology in *Ann. and Mag. Nat. History,* 1871, and Professor Huxley has indicated the more important characters in his *Anatomy of Vertebrated Animals,* 1871.[1] During the past year I have had opportunities of dissecting two examples of the Chimpanzee, both young males, but one of them very much younger than the other, so that I was able to disarticulate the skull with the greatest ease.

In this paper I propose to treat of its osteology, myology, and such points in the nervous system and arteries as seem worthy of record.

With regard to the skeleton, most writers have instituted comparisons between the skull of the adult chimpanzee and the adult human skull, whereby the ape's cranium certainly suffers, and the human skull stands out in bolder relief. Let the comparison be made between the skull of a young Chimpanzee and a human fœtus at birth, bone for bone, then many of the most marked peculiarities of the ape's skull, as contrasted with man's, vanish, and so far as the actual form and relations of the individual bones are concerned, the difference will be found not so great as might be imagined. It may be argued that it is unfair thus to contrast an immature skull with one that is thoroughly adult, nevertheless peculiarities of the fœtal skull often persist even to adult life, and if a point of distinction in the adult also characterises the *fœtal* skull, it at once raises it on sure ground as an *absolute* point of difference if it be wanting in the ape's skull. The bones composing the cranium will be first considered :—

The Sphenoid.—The pre-sphenoid is represented by a vertical plate of bone with two circular shallow depressions on each side. At its upper and anterior part it forms a distinctly triangular projection, which passes between the almost opposed orbital plates of

[1] Dr Champneys has described in this *Journal*, vi., p. 176, Nov. 1871, the muscles and nerves of the Chimpanzee, and compared them with those of Anubis.

the frontal bone to gain the cribriform plate of the ethmoid. Were it not for this narrow spine, the pre-sphenoid would be completely bridged over by the union of the two horizontal plates of the frontal posterior to the ethmoid bone. Two large sinuses occupy the base of the pterygoid process, the lingulæ, and the adjacent parts of the ali-sphenoids. The vidian canal, which is very small, gives rise to a projection on the floor of each sinus, and near the anterior part lies exposed in the cavity. The ali-sphenoid is prevented from articulating with the parietal by reason of the squamosal passing between the two bones to join the frontal, as it does occasionally in man. At birth the ali-sphenoid is separated from the parietal by means of a fontanelle, and very frequently a large wormian bone known as the *epipteric* bone occupies this situation in the adult skull.

The sphenoidal fissure is large; in one of my specimens the foramen rotundum is not separated from the fissure. The foramen ovale is not complete in the sphenoid itself, but appears as a deep notch in the hinder border of the ala, requiring the junction of the pterotic portion (tegmen tympani) of the temporal bone to make it a complete foramen. The large size of the sphenoidal fissure and the condition of the foramen ovale correspond exactly with the appearance of the parts in the human fœtus but a foramen rotundum communicating with the fissure, I have never seen in man. This condition of the foramina is interesting in connection with a rule which I have formulated with regard to the foramina of the human skull. *Whenever a nerve pierces a bone, it marks the confluence of two or more ossific centres, or the foramen transmitting a nerve is formed by the apposition of two or more bones.* Thus the optic foramen is formed by the orbito- and pre-sphenoids, the vidian canal by the junction of lingula, ali-sphenoid, and internal pterygoid process, the mode of formation of the sphenoidal fissure is obvious, and that of the foramen ovale has been described. The most apparent explanation of the foramen rotundum is to regard it as a segment of the sphenoidal fissure, unless the statement of Rambaud and Renault can be verified (*Origine et Developpement des os*, Paris 1864), that the inner portion of the ali-sphenoid and the external pterygoid process have a separate nucleus. Some indication of this is afforded by the fact that a deep fissure extends from the posterior border of the ala almost to the foramen rotundum in fœtal skulls. If this nucleus can be shown to exist, the only exception to this rule concerning nerve-foramina vanishes.

The Occipital Bone.—Obliquity and backward position of the foramen magnum, smaller proportionate size of the condyles, and occipital protuberances, with faintly marked curved lines, are attributes of the occipital bone of the fœtus of man, and of the adult Chimpanzee. The anterior condyloid foramen at birth appears as a notch in the ex-occipital, but is converted into a foramen by the basi-occipital. Later, when these two parts are anchylosed, the hole appears entirely in the ex-occipitals, but the mode of its formation clearly shows that it forms no exception to the rule mentioned regarding nerve exits.

The ethmoid bone lacks a crista galli, or has it only faintly marked, and the occasional failure of the perpendicular portion of the bone to reach the nasal and frontal bone are the chief points of interest in this element of the skull.

The Frontal Bone.—The more important features of this element of the skull are the absence of the nasal spine and supra-orbital notches, the situation of these being marked merely by foramina leading from the diplöe. The horizontal or orbital plates come nearly into contact, so that the olfactory fossa, but for the intervention of the small spine of the pre-sphenoid, would be completely encircled by the frontal. The superciliary ridges are large and prominent. In one of my specimens the frontal sends down a process to join with the orbital plate of the superior maxilla. The process in question passes between the lachrymal and os planum of the ethmoid, completely separating these two bones. At birth the human skull lacks nasal spine and supraorbital notches.

The Temporal Bone.—This presents peculiarities, some of which are never found in the skull of man at any time of its development. The Chimpanzee and human fœtus agree in the following points :—There is no ossified stylo-hyal, but an ossicle representing the tympano-hyal is discoverable in both; the mastoid process lacks the prominence so characteristic of it in adult human skulls, there is a well-marked petro-squamous suture, and a vaginal process is wanting. In the Chimpanzee the floccular fossa is absent, the post-glenoid tubercle large, and the tympanic membrane is situated at the bottom of a long bony external auditory meatus; the zygoma is large. This latter group of characters is never found in the skull of the human fœtus, so that the differential points of this bone are well marked and distinctive.

THE FACIAL BONES.

One of the most striking attributes of the facial skeleton of the human fœtus is its small size compared with the brain case. This character is, of course, still further enhanced when compared with the facial skeleton of the Chimpanzee. Beyond the contrast of size, the two sets of bones have very much in common when they are examined one with another.

The Superior Maxilla.—One of its peculiarities is the persistence of the premaxillary bone to near the end of the first dentition and the extent to which it bounds the anterior nares, reaching up to the nasal bone, so as to completely exclude the superior maxilla from taking any part in forming the boundary of the anterior nares. I have in my collection numerous specimens of the superior maxilla taken from fœtuses at birth, where a process of the premaxilla may be clearly seen extending upwards and touching the nasal bone, so that in some cases at least the anterior nares of man are bounded by the premaxilla on their lower and outer sides.

The infraorbital foramen in the Chimpanzee is frequently double, sometimes single on one side, double on the other, so that this is evidently a variable character. If these foramina be carefully examined, the bridge of bone separating them from the orbit will be found traversed by a suture. The human superior maxilla presents a similar fissure at birth, and in adult skulls of the lower races of mankind, marking the point of union of two of its centres, the seat of anchylosis between the nasal process and the outer part of the maxilla being accurately indicated by the passage of the infraorbital branch of the fifth cranial nerve. In some skulls of the Chimpanzee the supernumerary infraorbital foramina occupy the suture between the maxillary and malar bones. The preponderance of the alveolar process in the fœtal jaw is another circumstance worthy of note in comparing the fœtal skull with that of the ape's.

The Malar Bone.—In the Chimpanzee, as in the human fœtus, the malar is a bone of relatively considerable size. In one of my specimens the bone is partially traversed by a suture, and in the fissure three nerve foramina exist. This is a point of some interest in connection with the rule regarding nerve foramina previous detailed. In the text-books of human osteology, one centre of ossification is given for the malar bone, but, in reality, ossific material is deposited in three distinct places during the development of the skeleton, and the nerves pierce the malar bone in a line exactly corresponding to the confluence of the three primary nuclei. Even in adult human skulls the malar has been found traversed by a suture.

The Palate Bone of the human fœtus and Chimpanzee present harmonious features, in the fact that the vertical plate is of no greater extent than the horizontal portion, and the foramen in its vertical plate is not spheno-palatine but ethmo-palatine, for it is completed by the lateral mass of the ethmoid. The Chimpanzee's palate bone only just peeps into the orbit by a very narrow border, but its sphenoidal process articulates to a considerable extent with the vomer on the inner side of the nasal fossa; whereas in man the alæ of the vomer and the palate bones scarcely come into apposition.

The Vomer is more pointed anteriorly than in man, and crosses the incisive foramen, whereas in him it is kept back by a jutting process of bone which springs up from the premaxilla.

The Inferior Maxilla exhibits a condition never found in man; its large symphysis, single median genial tubercles, upper and lower, and the absence of a chin, are obvious points of difference.

The single *nasal* bone, so characteristic of this ape, and the want of convexity, are two very striking points to note; but examples of obliteration of the nasal suture occasionally occur in man, and of which there is one very good example in the Museum of the Middlesex Hospital.

The *lachrymal* bone has two grooves, one lodging the nasal duct, the other receiving a projection from the nasal process of the superior maxilla.

The *turbinals* possess little of interest. They occupy a large portion of the nasal fossæ, agreeing in this respect with the human fœtus.

There yet remains some points to notice with regard to the skull.

In the Chimpanzee the length of the cranium in each of my specimens is exactly twice the length of the basi-cranial axis, against 2¼ times the excess of the cerebral length over the same axis in adult human skulls. Curiously, in the human fœtal skull, the cerebral length, in several specimens promiscuously selected, exceeded the basi-cranial axis three times in all the instances chosen. This is due, I believe, to actual preponderance of brain and not to relative shortness of the base of the skull.

The cranio-facial angle of man is distinguished from that of all mammals by the fact that, though it may be as open as 120°, yet in the higher races it frequently approaches 90°. In the fœtal skulls from which the measurements recorded above were taken, this angle invariably measured 120°, *i.e.*, the lowest limit. In one of my Chimpanzees the cranio-facial axis equals 115°.

The superciliary ridges of the Chimpanzee are very large, but the prominence of these ridges is equalled in the skulls of some of the natives of New South Wales.

The orbits, too, of the ape, in that they measure much more in the horizontal than in the vertical diameter, are by no means exceptional, this being a constant character in the fœtus at birth, and found frequently in the skulls of the lower races of mankind.

The sutures of the human skull remain long persistent, and when obliteration commences the process usually occurs first at the spot (named the *obelion*), corresponding to the posterior fontanelle of the infant. In the Chimpanzee, on the contrary, the *temporo-parietal* and *temporo-occipital* sutures are the first to suffer obliteration, and it occurs at an early period in the life history of these creatures, sometimes even before the end of the first dentition.

Reviewing collectively the differences presented by the skull of the Chimpanzee when compared with the human cranium, it is very obvious they must be divided into two classes:—

I. Those which occur as anomalies in the skull of man, and which for the most part consist of a persistence of conditions met with in the skull of the fœtus at birth. To such I would give the name *relative differences.* This class should include the following:—

1. Absence of nasal spine.
2. The relative preponderance of the facial skeleton.
3. Absence of mastoid, styloid, aud vaginal processes.
4. Articulation of squamosal with the frontal bone.
5. The large superciliary ridges and absence of the supra-orbital foramina.
6. The mode of formation of the foramen ovale.
7. The large alveolar processes of the superior maxillæ.
8. Small size of occipital condyles.
9. The fusion of the nasal bones.
10. The width of the orbits exceed considerably their vertical height.
11. The relation of the pre-maxillæ to the anterior nares.

II. Those conditions peculiar to the skull of the Chimpanzee, and which have not been described as occurring in the skull of man from birth upwards, I would term *absolute differences.* This list would include:—

1. The cerebral cavity less than 2¼ times the length of the basi-cranial axis.
2. The cranio-facial angle more than 120°.
3. The early obliteration of the temporo-parietal and temporo-occipital sutures.
4. The long bony external auditory meatus.
5. Diastema between the canine and adjoining teeth.
6. The anterior divergence of the superior alveolar arches.
7. Obliquity of the glenoid fossa and the large size of the glenoid tubercle.
8. The absence of a chin.
9. The large size of the foramina of exit of the cranial nerves.

It must be borne in mind that simian characters occasionally found in man's skull are *constant conditions* in the skull of the Chimpanzee, a fact of no mean importance in drawing a boundary line between the two groups *Anthropomorpha* and *Anthropidæ.*

The Hand.

Compared with man, the most noteworthy points in the hand of the Chimpanzee are the diminutive size of the thumb, its apex not reaching beyond the metacarpo-phalangeal articulation, the small size of the trapezium and trapezoid, the large size of the pisiform bone, and the length and slender form of the metacarpals. That these characters may now and then be found in the hand of man there can be no doubt, for in the Museum of the Middlesex Hospital there is the skeleton of a hand with diminutive trapezium and trapezoid, and a thumb whose distal end reaches no lower than it does in the manus of the ape. Diminutive size of the pollex is not an absolute feature of this ape's skeleton.

There remains yet one point in connection with the skeleton that requires notice, for it seems to have escaped attention. If the tibia of the Chimpanzee be compared with the corresponding bone of the human skeleton, it will be observed that in man the articular surfaces of the tuberosities look directly upwards, whereas in the ape, on account of the forward curve which exists in the upper part of the tibia, the surfaces for the femoral condyles look backwards and somewhat upwards. A condition precisely like this exists in the tibia of the human fœtus at birth.

The Muscular System.

It is customary in describing the muscles of the Chimpanzee, to mention only those which differ from the descriptions given by previous anatomists; this necessitates much tedious reference; to avoid this I have given an account of those muscles only which vary in their attachments, taking the condition of the muscles usually found in man as the standard. Wherever a muscle is omitted it signifies that its attachments accord with those of man.

The Muscles of the Face.

The muscles of the face were little differentiated and pale in colour; the muscles of the auricular region were absent.

The *Occipito-frontalis* was represented by muscular fasciculi, very pale and delicate, but nevertheless well pronounced.

The *Orbicularis palpebrarum* was fairly well developed, that portion of the muscle near the median line meeting with its fellow of the opposite side across the azygos nasal bone; some of these fibres were attached to the nasal bone, thus representing the pyramidalis nasi muscle.

The *Corrugator supercilii* was detected as a small slip lying under cover of the orbicularis palpebrarum.

The *Orbicularis oris* was seen as a broad elliptical sphincter, encircling the mouth, receiving a broad sheet of muscle fibre in its upper moiety in which thickenings alone represent zygomatic, levator anguli, and levator labii superioris muscles. A similar muscular stratum, prolonged from the platysma myoides, alone represent the muscles which in man act on the lower lip. The lips were large, loose, and capable of extensive protrusion.

The Muscles of the Neck.

The *Platysma myoides* was present as a broad muscular expansion, stretching over the triangles of the neck; passing over the lower jaw it ended by becoming continuous with the facial muscles. The muscle was far thicker than in man.

The *Sterno-cleido-mastoid.*—This consisted of two parts, one arising from the manubrium sterni, and being inserted into the mastoid portion of the temporal bone and into the squamous portion of the occipital bone, along the superior curved line; the clavicular portion remaining distinct, was attached to the lateral mass of the atlas; the spinal accessory nerve passed between the two portions.

The muscle called *Levator claviculæ*, and described by several anatomists, was not present. The depressors and elevators of the hyoid bone call for no special comment, except that the sterno-hyoid muscles were separated more than is usual in man by the laryngeal sac.

The Muscles of the Back.

The trapezius presented the usual conditions found in man but was somewhat blended with the latiss. dorsi below.

The *Latissimus dorsi* sent the slip down to the internal condyle known as the *dorsi-epitrochlearis*, but the additional slip so frequently found crossing the axilla in man, and certain of the quadrumana, was not present.

The *Rhomboids*, minor and major, were represented by a single muscular sheet.

The *Levator angula scapulæ* arose from the tubercles of the transverse processes of the five upper cervical vertebræ, the slips of origin remaining distinct until near their insertion into the superior angle of the scapula.

The *Serratus posticus inferior* was inserted as in man into the outer surface of the ninth, tenth, eleventh, and twelfth ribs, just external to their angles.

Nothing of interest was noted in connection with the remaining lumbar muscles.

The Muscles of the Upper Limb.

Pectoralis major.—The muscle lacked the division into external and clavicular portions so constant in man. The groove usually found between it and the deltoid muscle was absent, many fibres of the pectoralis major becoming continuous with those of the deltoid.

Pectoralis minor.—A small muscle arising from the third, fourth, and fifth ribs external to their junction with the cartilages, then forming a narrow rounded tendon four inches in length to pass over the coracoid process of the scapula to blend with the upper part of the capsule of the shoulder joint.

Deltoid.—Fairly well developed, some portions of its inner border blended with the pectoralis major. Between the deltoid and the capsule of the shoulder-joint there was an enormous bursa extending under the acromion and coracoid processes.

Biceps.—Possessed two heads of origin which united very low in the arm.

Coraco-brachialis.—This muscle was inserted into the upper third of the inner border of the shaft of the humerus, and into the capsular ligament. The fibrous arch so frequently found stretching across the tendon of the teres major, and receiving part of coraco-brachialis in man, was not represented. The external cutaneous nerve was absent, consequently the muscle was not divided into two parts, as is usual in man, to allow of the passage of the nerve. This condition of things is far from uncommon in the human subject. I met with it five times in thirty bodies in the winter session 1882. The rotator humeri of Wood was not represented.

The chief peculiarities in the muscles of the fore-arm result from the small size of the flexor longus pollicis, which leaves the middle portion of the shaft of the radius to be taken up by other muscles.

Flexor sublimis digitorum.—This muscle arose from the internal condyle of the humerus, the side of the coronoid process, and the oblique ridge of the radius; it then divided into *three* tendons, passing under the anterior annular ligament to be inserted in the bases of the second phalanges of the third, fourth, and fifth digits, after being perforated as usual by the deep flexor. The outer tendon came off from a muscular slip forming quite a distinct *flexor sublimis indicis* and had a tendinous intersection at its upper third. Its tendon was inserted into the base of the second phalanx of the index finger, after being perforated by the tendon of a deep flexor, which formed a *flexor profundus indicis.* This muscle, so far as its origin is concerned, corresponds exactly to a flexor longus pollicis, for it arose from the middle portion of the shaft of the radius, on the anterior surface, between the supinator brevis and the pronator quadratus; it had, in addition, an accessory slip springing from the side of the coronoid process of the ulna as is usual with the flexor longus pollicis, the tendon then passed to be inserted into the terminal phalanx of the index finger after perforating the superficial flexor; as the muscular belly approached the angular ligament, a small bundle of pale fibres, gradually terminating in a very thin but distinct tendon, were inserted into the terminal phalanx of the pollex as the representative of the *flexor longus pollicis.*

Flexor profundus digitorum arose as usual from the ulna, but consisted of three tendons, the first, or one going to the index digit, being separate as described above; the three inner tendons going to the three inner digits piercing the sublimis as is usual.

The flexor tendons were provided with vincula and other acessories usually encountered in the flexor tendons of the human manus.

The *Extensor ossis metacarpi pollicis* had a divided tendon, the outer slip being inserted into the os trapezium, the other to the outer side of the base of the metacarpal bone of the pollex.

Extensor secundii internodii pollicis was inserted into the bases of the first and second phalanges of the pollex.

Extensor primi absent, but *extensor indicis* well formed.

Abductor, opponens, flexor brevis, and *adductor pollicis* were present; the adductor, in addition to its usual insertion into the base of the first phalanx, sent a small tendon to be attached to the base of the second phalanx.

The Muscles of the Lower Limb.

The *iliacus* has the same relations as in man, but is not so large relatively as in him.

The muscle which calls for comment more than any other in the thigh is the one named *Scansorius.* I believe it was first described by Traill (1818). He writes concerning it:—"The most remarkable muscle about the top of the thigh has not been noticed by Tyson, Camper, Cuvier, or the older anatomists. It is a flat triangular muscle arising from the whole anterior edge of the ilium to within half an inch of the acetabulum, and is inserted to just below the fore part of the great trochanter, between the head of the cruralis and the vastus externus, a litle below the origin of the former; it is thin and fleshy throughout its whole extent, except where it is inserted by a very short, flattened tendon. At its upper part it is united by cellular substance to the iliacus internus. The action of the muscle which appears to be peculiar to this animal is to draw the thigh upwards towards the body; and it seems especially intended to assist in climbing. On this account we propose to call it the *scandens* or *musculus scansorius,* and we are disposed to regard this as one of the principal peculiarities of the muscle." The description of the muscle, as given by Traill, accord with those in my specimens in every particular. This muscle will be referred to later on.

Sartorius, rectus, and quadriceps extensor have similar relations to those usual in man, but the rectus had only the straight head.

The *Gracilis* was very broad, as in quadrumana generally.

The *Adductor magnus* is fleshy, even to its insertion into the tubercle on the internal condyle.

Biceps femoris possessed only an ischial head; semi-membranosus and semi-tendinosus had nothing beyond their usual attachments.

The *Tibialis anticus*.—This muscle was of good size, arose from the tibia as in man, as the tendon neared the anterior annular ligament it divided into two, one strong slip being inserted into the inner surface of the internal cuneiform; the other, the smaller of the two, passed to its insertion into the inner surface of the base of the metatarsal bone of the hallux. This resembles in a very forcible way the *ex. ossis. metacarpi pollicis.*

Peroneus tertius not represented.

The *Gastrocnemius* was fleshy even to its insertion into the os calcis.

The *Soleus* arose from the upper third of the posterior surface of the fibula only, was fleshy even to its insertion into the os calcis, and remained distinct from the gastrocnemius muscle throughout.

The *Plantaris* was present with its usual peculiarity of tendon, and was attached on the inner side of the calcaneum.

Popliteus was present.

The *Flexor longus hallucis* arose from the posterior surface of the fibula, passed in a grove formed by lower end of tibia, astragalus, and os calcis; its thick and strong tendon then split, one piece being inserted into the terminal phalanx of the hallux, the remaining two tendons being inserted into the last phalanges of the third and fourth toes, after piercing the corresponding tendons of the flexor brevis digitorum. This occurs as an anomaly in man, and was the condition of this muscle in the foot of the Bushwoman dissected by Professor Flower and Dr Murie (*Jour. of Anat.*, vol. i., 1867).

The *Flexor longus digitorum* arose from the posterior surface of the shaft of the tibia and from its inner tuberosity; it passed under the internal annular ligament, and in the sole of the foot divided—one tendon was inserted into the terminal phalanx of the second, the other into the corresponding part of the fifth toe, perforating on their way the flexor brevis tendons. The tendon of the long flexor blends with the short flexor in the sole of the foot.

The muscles of the first layer in the sole of the foot were four in number, as is so very frequently the case in man, viz. :— abductor hallucis; abductor minimi digiti; the *abductor ossis metacarpi quinti digiti,* which arose from the outer side of the os calcis, and was inserted into the base of the fifth metacarpal bone; and the flexor brevis digitorum or perforans, which arose from the os calcis by a tendon common to it and the abductor pollicis. Some of its fibres join the long flexor in the middle of the foot; it then ends in three tendons, for the second, third and fourth toes, which, after splitting to allow the long flexor to pass through, unite again for insertion into the base of the phalanges.

Accessorius not represented.

Lumbricales, four in number, and of good size, arose in the following order:—

The inner one came off from the tendon of the long flexor; the second, third, and fourth arose from the tendons given off by the flexor hallucis, the outer tendon affording origin to the third and fourth lumbricales. They all passed to the tibial side of the four outer toes to join the expansion of the extensor tendons.

Flexor brevis hallucis well formed. The *adductor* arose from the sheath of the peroneus longus, the heads of the four outer metatarsal bones, and from a considerable portion of their respective shafts, so that it appeared as a broad triangular muscle hiding the metatarsal bones from view, with its apex attached to the outer side of the base of the first phalanx of the hallux in common with the outer portion of the flexor brevis hallucis.

The *interossei* were arranged as in the hand, the middle toe affording attachment to the second and third of the dorsal series, so that the imaginary line of action of these muscles passed through the third toe, and not the second as is usual in man.

On comparing the muscular system of the Chimpanzee, it will be found to differ from that of man in few important particulars. Those most deserving attention are the modification of the muscles of the *pollex,* the *scansorius,* the *dorsal interossei* of the foot, and the absence of *peroneus tertius.*

All published accounts of the dissection of the creature show that the *flexor longus pollicis* is either extremely small or absent. This alteration in the size of the muscle renders vacant a considerable space on the anterior surface of the shaft of the radius; this area of bone usually becomes taken up by the outer portion of the *flexor profundus digitorum*, which in some cases differentiates into a distinct muscle, *flexor profundus indicis*. The interest of this condition centres itself in the explanation it offers as to the mode of differentiation of distinct muscles from a common muscular sheet: a tendon rises from a certain number of muscle-fasciculi; the digit receiving that tendon is used more frequently than its fellows, hence that portion is called upon to contract with greater frequency, and, as a consequence, that part of the common mass belonging to the tendon in question becomes specialised as a separate muscle.

The existence of an *extensor primi internodii pollicis* has not yet been recorded. Wilder professes to have seen one, but his account of the dissection clearly shows that the tendon he describes was really part of the *extensor ossis metacarpi*, for he says it was inserted into the radial side of the base of the metacarpal bone of the thumb.

The *scansorius* requires some further notice. It would appear that this muscle really represents the *tensor vaginæ femoris* of anthropotomy, except that it is inserted into the femur instead of the fascia of the thigh, but this difference may be readily explained by the peculiar conformation of the hip-joint in this ape. On looking at the living Chimpanzee, one cannot fail to notice the facility the creature possesses of raising the lower limbs at right angles to the trunk in the abducted position, so that when both legs are thus stretched out the heels and ischial tuberosities are in one straight line. This position is admirably shown in the figure of an Orang in Cuvier's *Règne Animal*. To put the legs in this position in the human subject would cause dislocation of the hip-joint; yet the apes assume this position with the greatest ease, chiefly on account of the shallowness of the acetabulum and the more flattened shape of the head of the femur. The *scansorius*, on account of its insertion just below the greater trochanter, must be a powerful agent in raising the femur to this horizontal position. If we compare the construction of the hip-joint of the Chimpanzee with that of man, we shall find that in man the acetabulum is deeper, and the head of the femur more globular, so that the movement of abduction is restricted; consequently the utility of the muscle is limited to that of an abductor and rotator, its development becomes of secondary importance; hence its attachment to bone gradually falls away, and it remains as the *tensor vaginæ femoris,* with fascial attachment only. In Professor Humphry's dissection the scansorius was absent, but the tensor vaginæ was represented.

The absence of the *peroneus tertius* seems to be a prevailing condition in the Chimpanzee.

The *dorsal interossei* of the foot taking the *middle toe* and not the second as their central line of action, is another constant condition in the Chimpanzee.

With regard to the muscular system, it would appear that the following list includes the principal peculiarities of the muscles which may be ranked, under our present knowledge, as *absolutely* differing from man:—

1. The scansorius (tensor vaginæ femoris), its insertion into the femur.
2. Absence of, or puny size of, flexor longus pollicis.
3. Absence of extensor primi internodii pollicis.
4. Absence of peroneus tertius.
5. Gastrocnemius and soleus inserted separately, the muscles continuing carneous to their insertion, and the soleus possessing only a fibular head.
6. The large size of the adductor hallucis.
7. The third toe having two dorsal interossei attached to it instead of the second toe, as in man.

The Arteries.

Few peculiarities of the blood-vessels occurred worthy of note. The arch of the aorta gave off its three large trunks, as is the usual arrangement in man, but it possessed in addition a rather large thyroidea ima: it arose from the aortic arch between the origin of the innominate and the left carotid arteries, passed vertically upwards on the trachea to within half an inch of the cricoid cartilage, to be distributed to the mass of tissue representing the remains of thymus gland. This is of some interest, for I feel certain that the occasional existence of this little artery may be explained in the following manner:—The thymus gland derives its blood supply from the aorta, innominate, and occasionally the right carotid or internal mammary arteries; gradually the gland atrophies, usually the nutrient vessels dwindle and generally disappear, or remain as the tiniest twigs to the neighbouring cellular tissue, but now and then one or other of them persists, increases in calibre, and becomes of a size sufficient in importance to demand a name—*thyroidea ima.* This account of its growth will also explain its variable place of origin—sometimes the aortic arch, at others the innominate, carotid, or internal mammary arteries.

The *arterial polygon* at the base of the brain was formed as in man, except that the anterior cerebral arteries, instead of being connected by an anterior communicating, joined and formed a single trunk for an inch of the course, then bifurcating, were distributed as usual. This is interesting, not only as an occasional condition found in man, but also an example that *arteries running in the same direction and parallel have a tendency to fuse together.*

The *anastomotic* of the femoral possessed a very large superficial branch, which accompanied the internal saphenous nerve down the leg, finally to pierce the first interosseous space to join the deep plantar arch. The anterior tibial artery existed, but was very small. This condition of the superficial branch of the anastomotica is frequent in many animals I have dissected; now and then a large artery may be found accompanying the saphenous nerve in man, and has been named the *great saphenous artery.*

THE NERVES.

It has long been contended by physiologists that the motor branches of the vagus which enervate the muscles of the larynx are in reality derived from the spinal accessory, and certain authors have stated in support of this view that, in the Chimpanzee, the spinal accessory sends a branch direct to the larynx, and this twig has no connection with the vagus. The author of the statement that the spinal accessory does send such a branch is Vrolik, who, in the monograph referred to at the commencement of this paper, not only describes but actually figures the nerve in question. Such a condition as this, if it really existed, would of course have a very important bearing on the question as to the source of the motor nerves of the larynx; but unfortunately Vrolik's statement cannot be verified. The relations of the ninth, tenth, and eleventh cranial nerves correspond to those of man in both my specimens. Vrolik also states that the condition of his Chimpanzee was such as not to admit of the careful dissection of the brain and cranial nerves, on account of its being badly preserved. Vrolik and Champneys appear to be the only anatomists who have published an account of the nerves of this creature; possibly others have found so close a resemblance to man in this respect as not to deem it necessary.

In both my specimens I found that the *glosso-pharyngeal* nerve sent off a branch which pierced the sheath of the hypoglossal nerve immediately after it hooked round the occipital artery, then, quitting the nerve, joined the descendens noni so as to form part of the *ansa hypoglossi*.

The *musculo-cutaneous* nerve of the brachial plexus did not exist as a separate branch, but the muscles usually supplied by it received their nerves from the median. I met with this anomally five times in twenty-two subjects in the winter session 1881–82.

The *second dorsal nerve* did not send any branch to assist in the formation of the brachial plexus, as it frequently does in the Macaque monkey and in man. This condition has lately assumed some importance in relation with Ferrier's researches on the nerves of the iris.

The *median* is curiously arranged in this animal. After passing the elbow and distributing motor twigs to the muscles of the inner condyle, it gives off a rather large branch, which passes deeply beneath the muscles, and joins the ulna nerve just above the middle of the fore-arm; the main trunk continues down to the hand, and is distributed as usual to the muscles of the thumb, situated to the outer side of the flexor longus pollicis tendon, the two outer lumbricles, and the first three and a half digits, exactly as in man. It is the communication with the ulna that is worthy of attention, for it was constant in both fore-arms of my two specimens. Vrolik records it as present in one arm but not in the other, therefore he regarded it as an abnormality. I found it present in two Chimpanzees, Macaque, Ateles, and Cynocephalus. After the branch joins the ulnar nerve, if a little care be exercised, it may be easily traced to the palm, where it supplies one and a half fingers, and takes on, in fact, the distribution of the ulnar nerve; but the true ulnar nerve, after giving off a very small twig to the median portion, turns to the back of the hand to supply one and a half fingers. By this arrangement the median nerve supplies the whole of the palm of the hand. In man I have five times found a slip passing from the median nerve to the ulnar, lying deeply below the superficial flexors. I believe it was first described by Krause and Telgmann in *Les Anomalies dans le parcours des nerfs chez l'homme*, 1869, but is not very generally recognised as a frequent variation by anatomists.