LECTURES ON HUMAN MYOLOGY.

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By G. M. HUMPHRY, M.D., F.R.S.,

Lecturer on Anatomy and Physiology in the College; Professor of Anatomy in the University of Cambridge; etc.

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THE dorsal or supinator-extensor mass in the lower limb, if we except the covering fascia, is quite cut off from the upper segment of the limb. In many of the lower animals, however, it takes an origin from the femur. In some, it is extensively connected with the femur and with the thigh-muscles, and is extensively inserted into the leg-bones, so as to form an important adjunct to the extensors of the leg. A similar disposition to this is retained in the upper limb, forasmuch as a considerable part of the supinator-extensor mass arises from the humerus, and some part of it is inserted into the radius. It has to be observed, that this origin is confined to the radial or pre-axial condyle, because the uprising of the olecranon cuts off the mass from the middle and the post-axial parts of the end of the humerus.

The radial sector of the superficial stratum in the upper limb arises entirely from the upper segment of the limb; and a portion of it—in some of the lower animals, the whole of it—is inserted into the radius, constituting the supinator radii longus. This muscle is so situated as to have a flexor action upon the elbow; and, in some instances of contraction of the joint, it presents a formidable obstacle to extension. A portion of the sector runs on at a deep level beneath the elements of the deep stratum which cross it, over the carpus to the metacarpus, constituting the extensores carpi radiales.

The corresponding or tibial sector in the lower limb forms the tibialis anticus, and passes from the leg-bones entirely over the ankle to the tarsus and metatarsus, there being no subdivision of it; so that the tibialis anticus contains the blended serial representatives of the supinator longus and the extensores carpi radiales, besides, as presently to be mentioned, in part at least, those of the upper two extensors of the pollex. In the inturned position of the foot, the tibialis anticus becomes associated with the flexors in maintaining and increasing that inclination. Hence it commonly is necessary to divide it, as well as the tendo Achillis and the tibialis posticus, in the operation for the cure of talipes varus.

The ulnar sector—the extensor carpi ulnaris—arises partly from the humerus and partly from the ulna; the ulnar fibres, which in some animals serve as an insertion, here constituting an origin. It is continued in its entire thickness to the metacarpus.

The fibular sector, which is the homologue of the ulnar sector, is disposed in a rather remarkable manner. It is divided into the three peronei. Of these, one—the peroneus tertius—passes to the fibular metatarsal, and so corresponds more closely than either of the other divisions, in function as well as position, with the extensor carpi ulnaris. A second part of the sector, forming the peroneus brevis, passes to the same metatarsal; but, in consequence of its travelling behind the malleolus, instead of in front, it becomes, although supplied by a branch of the same nerve, an antagonist to the former portion and a flexor of the ankle. In this it resembles the extensor carpi ulnaris of Birds, which, though supplied by the radial nerve, lies on the flexor aspect of the carpus, and so acquires a flexor action. The course of the third portion—the peroneus longus—which passes from a comparatively superficial position on the fibular side of the extensor aspect of the leg, through the deepest level in the sole, to the metatarsal bone on the tibial side of the foot, is very peculiar. It is not paralleled by anything in the hand; and it is a very general mammalian feature, but is not, I believe, met with in animals below Mammals, and in these it not unfrequently detaches tendons to the fifth and other metatarsal bones. Its spiral course reminds us of that of the internal rectus in the Bird's leg, which passes from the fore part of the pelvis just above the hip, outwards, athwart the front of the knee, into the flexor of the digits. It is a very important agent in supporting the arch of the foot, and throwing the weight of the body forwards over the ball of the great toe.

The peronei are a good illustration of the manner in which, as just

alluded to in the case of the supinator radii longus, a difference of direction and position will separate and give antagonistic action to members of the same group of muscles which are supplied by the same trunk-nerve—showing that it is position, rather than similarity of nerve-supply, which determines the harmonious action of muscles. The peroneus brevis and longus are, by virtue of their position, combined with the tibialis posticus, and serve, with it, to maintain the arch of the foot and brace the ankle during the period in which the force of the gastrocnemius and soleus is exerted upon one extremity of the arch, and the whole weight of the body is thrown upon its centre. The attachment of the peroneus brevis to the laterally projecting process of the fifth metatarsal bone enables it to spread out, to some extent, the balls of the toes, and also to brace the lateral arch of the foot, which has a tendency to bulge at this point.

The intermediate sector on the dorsal aspect forms the extensor digitorum longus, better called sublimis, in both limbs. It presents very little difference in the two limbs, beyond the point already alluded to in speaking of the supinator-extensor masses, that, in common with the other components of this stratum in the upper limb, it arises from the proximal segment of the limb; whereas in the lower limb it does not, in Man at least, extend above the knee. In each limb, it is more closely connected with the post-axial (ulnar or fibular) than with the pre-axial sector; and, like the corresponding, or rather the antagonistic, sector on the flexor aspect—the flexor sublimis digitorum—it omits to supply the first or pre-axial digit.

The fibres of the deep stratum of the supinator-extensor mass have an oblique direction from the post-axial to the pre-axial side, as well as downwards; and in each limb they omit to supply one or more of the post-axial digits. Thus digit I is supplied by the deep stratum only; digit V is supplied by the superficial stratum only; and the other digits in the foot, and some of them in the hand, are supplied by both strata.

In the upper limb, this deep stratum has an attachment to the humerus; and the uppermost portion of it, so arising, forms the supinator radii brevis. The next portion, arising from the ulna and the radius, forms the muscle which is usually called the extensor ossis metacarpi pollicis, but which, comparative anatomy tells, should be called supinator manûs, forasmuch as the mobility of this metacarpal is exceptional, whereas the muscle is very commonly present, and is very often attached to the carpus, or to the carpus and the metacarpus; and this is commonly the case even in Man. The presence of these two deep supinators as separate muscles in the upper limb has relation to the power of supinating the radius upon the humerus and the ulna; and there are no separate representatives of them in the hind limb. The supinator brevis cannot be said to have any representative at all; and the representative factors of the supinator manûs are blended with the deeper part of the tibialis anticus. In the hind limb of the higher Apes, where the metatarsal is free to move, these factors form a muscle more or less separate from the tibialis anticus, and corresponding almost precisely with the supinator manûs in Man.

Immediately below the supinator manûs in the fore limb, travelling with it, and apparently a derivative or segment from it, is the extensor primi internodii pollicis. It is very rarely met with in any animal except Man, and in him is not unfrequently wanting, or is scarcely segmented from the supinator manûs. In the lower limb, it, like the last named muscle, is represented only by some of the deeper fibres of the tibialis anticus.

The remaining muscles of the deep stratum in the two limbs appear at first a little difficult to throw into harmonious grouping. They all pass upon the digits, and are extensors of them. Uppermost is the extensor secundi internodii pollicis, which corresponds sufficiently closely to the extensor hallucis. Near to it is the extensor indicis, which has no apparent homologue in the lower limb; and in that limb the extensor brevis digitorum is a very regular muscle, which has no apparent homologue in the upper limb. These two muscles in the two limbs—the extensor indicis and the extensor brevis digitorum—lie at somewhat different levels; still both are intermediate between the extensor digitorum longus, or sublimis, and the interossei, and are more or less blended with these. Taking them all together, and seeing that they are all segments of the common supinator-extensor masses, we learn that these masses in each limb have, as regards their disposition upon the digits, a tendency to resolve into three, or, if we include the interossei, into four, layers superimposed upon each other. Of these, the superficial layer forms the extensor digitorum sublimis, of which I need only say, in addition to what has been already stated, that, unlike what occurs in the primitive disposition of parts, it has the least peripheral extent of the three, stopping in ourselves, in great measure, at the second phalanges; and in some animals, like the radial and ulnar sectors, not extending beyond the metatarsus or the metacarpus.

The next or intermediate stratum, attached above to the fibula or the ulna, is represented in the lower limb by the extensor hallucis, and in the upper limb by the extensor tertii internodii pollicis and the extensor indicis, and not unfrequently by an extensor tertii and even quarti digiti. The third or deep stratum is formed in the lower limb by the extensor brevis, better named profundus, digitorum; but has usually, in Man and most Mammals, no representative in the upper limb, which is probably partly in consequence of the limited area for the origin of such a muscle which the carpus presents, in comparison with the tarsus, as well of the close apposition to the carpus of the tendons passing over it. The members of the three strata are blended, and are blended with the interossei and the lumbricales, in the common extensor tendons; the elements of the deeper strata extending beyond those of the superficial stratum, or carrying the marginal fibres of the latter on with them to the terminal phalanges. Such is the ordinary disposition in the two limbs in Man. We find, however, in other animals, and not unfrequently in Man, various additional gradational evidences of these muscles blending in, or of their more or less imperfect segmentation from, the common mass, and of their homologous nature in the two limbs.

Thus an intermediate extensor of the fifth or smallest digit is derived in Man, not from the intermediate, but from the superficial stratum, in the form of the extensor minimi digiti, in the fore limb, and of the offset from the peroneus brevis to the extensor tendon of the fifth toe in the hind limb. We know also that, in lower mammals, accessions to the extensors of the other digits are not unfrequently supplied from the same source as the extensor minimi digiti in the fore limb, and from the peronei in the hind limb; and these accessions hold the same relation to the tendons of the extensor sublimis as do the elements of the intermediate stratum when present. In fact, it is evident that one set are the substitute for, or the near homologues of, the other set.* Interesting illustrations of this are furnished by the Orang and some other of the Apes, in which the extensor indicis† has often been found to supply the third finger, and the extensor minimi digiti to supply the fourth finger; so that in this animal a second, or additional, or deep extensor is furnished to each of the digits—all showing, as was remarked by Professor Huxley in this place, that the extensores indicis and minimi digiti are not especially developed, as is sometimes stated, in the hand of Man, but are fragments of a more extensive system of deep muscles found in lower animals. Again, the extensor profundus digitorum pedis in some Reptiles and Mammals is inseparably united with the interossei; and in most animals, as well as Man, it blends with the extensor sublimis upon the digits. An extensor profundus in the fore limb, closely answering to that in the hind limb, is found in the Cryptobranch,‡ and in many Batrachians and Reptiles, and not uncommonly in Mammals.§ Occasionally even it puts in an appearance as a variety in Man. It sometimes extends upon the ulna; and it appears usually in the fore limb, to take the place of, or prove a substitute for, the members of the intermediate stratum, as it for the most part does in the hind limb. Still, the two strata have been found associated in the human hand.

The interossei and the other short muscles of the distal segments are the intrinsic muscles of the segment. They are variously disposed, and are in various ways connected with the carpus and the phalanges, and with the flexor and extensor tendons, in different animals and in different parts of the same limb. Some pass from the carpus or the tarsus to the metacarpus or the metatarsus, forming carpo-metacarpals or tarso-metatarsals. These are present in each digit of the Cryptobranch; but they are confined to digits I and V in ourselves, and constitute the opponens muscle of each of those digits. Others pass from the carpus and the metacarpus, or from the tarsus and the metatarsus, to the phalanges. They are in ourselves limited to digits I and V, and constitute the abductores, adductores, and flexores breves, of those digits. Some of these—the adductors of digit I more particularly in each limb—extend their range of origin upon adjacent metacarpals and metatarsals, and so acquire a more transverse direction. In the foot, a portion of this series, ranging more widely than the rest, and taking

origin from the distal ends of the metatarsals, and segmented from the rest, constitutes the transversus pedis.

In the case of the other digits, these muscles form what are called interossei, and pass into the sides of the extensor tendons, as well as to the sides of the phalanges. This is because the lateral inclination of the fingers which they effect is always associated with extension. In flexion, the fingers are simply drawn towards one another and towards the palm; and we cannot, without difficulty and practice, give to them a lateral inclination during this movement; whereas during extension we can separate them and incline them either way. As is well known, it is these marginal parts of the extensor tendons, thus reinforced by the interossei, which run on to the terminal phalanges; while the middle parts, comprising the chief of the factors of the extensor digitorum sublimis, are inserted into the second phalanges. This disposition, which differs, it may be remarked, from that on the flexor aspect, where the lateral tendons are arrested at the second phalanges, while the middle or perforating tendons pass on to the terminal phalanges, does not seem to depend altogether upon the accessions from the interossei, forasmuch as it occurs in some animals in which these accessions are not present. It occurs also in the foot, where, in accordance with the more limited lateral movements of the toes, the interossei have less connexion with the extensor tendons than in the hand. The flexor and extensor tendons are, however, alike in the fact that the deeper elements have the more distal range, and reach to the terminal phalanges. This is a deviation from the simple disposition in the Cryptobranch, where the superficial fibres extend the farthest.

Although I have said that the movement of inclination of the digits from side to side is associated with extension of them, and that, therefore, the interossei are connected with the extensor tendons, yet it will be observed that during flexion from the expanded condition, the fingers are drawn or inclined towards the middle one. The three interossei which effect this are situated nearer the palmar aspect, and are called "palmar interossei"; and they are thrown more into relation with the flexor muscles than are the dorsal interossei. They range upon the palmar aspect of the carpus and metacarpus to a variable extent in different animals; and they are in some, as the Hippopotamus, supplemented by an additional more superficial set, which act as still more powerful adductors of the marginal digits.

In the foot, the strong and comparatively fixed hallux acts as a barrier to inclination of the toes in that direction, and causes the spreading out of the toes to be limited almost exclusively to and from the fibular side of the foot. Here, therefore, the arrangement of the interossei is somewhat different from that in the hand, the three plantar muscles adducting to the second toe instead of to the third. The view I take, that the immobility of the hallux is the cause of the disposition of the interossei in the foot differing from that in the hand, derives some countenance from the fact that in the Apes, where the hallux is as movable as the pollex, the interossei are disposed as in the hand—that is, they adduct to and abduct from a line drawn through the third digit.

I may mention that in Man the interspaces between the metacarpals and metatarsals, especially the former, are relatively wider than in other animals; and the interossei have, accordingly, more space between them, and extend, or rather present, more upon the dorsal aspect, in him than they do in other animals. This has relation to the free lateral movements or spreading of the digits, which is conspicuous, especially in the hand of Man, and to which, as I have just said, the interosseal muscles minister.

While speaking of the interosseous muscles as "dorsal" and "plantar," I should add that in the primitive state this distinction does not exist. They then form, as seen in the Cryptobranch, a mere simple sheet of fibres, stretching transversely between the several metacarpals or the metatarsals, with an inclination towards the several phalanges, which gives a curved line to the distal edge of each. By a deepening of this curve into each interosseal space, and an extension of the muscle upon the phalanges and the extensor tendons on each side, each interosseous muscle is divided into two muscles appended to the approximated sides of the two digits bordering upon the space. In this way, one interosseus is provided to each side of each digit, passing from the side of the metacarpal or the metatarsal to the side of the digit, which is the proper complement of these muscles. The division, however, does not in each instance take place so as to divide the muscle into two equal parts; that is to say, the division does not exactly follow the middle line of the interosseous space so as to restrict each muscle to its own metacarpal or metatarsal. On the contrary, one muscle in an interspace sometimes retains a hold of both the bones bounding the interspace, so dwarfing and concealing the other or twin muscle. Thus, in the hand, the interosseus, passing upon the radial side of the third or middle finger, not only rises from that side of the

* This is well illustrated in the dissection of the Seal and the *Orycteropus* (*Journal of Anatomy*, ii, 307). I have there applied the term "extensor secundus" to the series of muscles in the Seal. The term "extensor intermedius" would have better indicated their relation to the extensor sublimis on the one side, and to the extensor profundus on the other.

† In the Chimpanzee also I found that the extensor indicis sent a slip to the middle finger (*Journal of Anatomy*, i, 267). This is not always so. Indeed, the muscles in question are subject to a good deal of variety in these animals, as well as in Man.

‡ *Journal of Anatomy*, vi, 42; *Observations in Myology*, p. 42.

§ *Journal of Anatomy*, iv, 47. I there intimate that the smaller and deeper portions of the extensor digitorum in the fore limb of the Manis are the representatives of the extensor digitorum brevis (profundus), which I found well developed in the fore limb of the Unau, Ai and Cyclothurs.

third metacarpal, but also retains a connexion with the ulnar side of the dorsal aspect of the second metacarpal. It thus to some extent dwarfs, and it conceals from view, dorsally, the interosseus which arises from the ulnar side of the metacarpal, and which passes to the ulnar side of the second or index finger. A similar encroachment in the case of the ulnar interossei of the third and fourth fingers, and of the radial interossei of the index finger, gives a dorsal prominence to all these, and restricts the remaining interossei to the palmar aspect of their respective metacarpals. In the foot, the same thing occurs, with the exception that the muscle on the fibular side of the second toe, instead of being pushed out of the field dorsally by its neighbour on the tibial side of the third toe, as is the case with the corresponding muscle upon the index finger in the hand, grows into prominence, absorbs the fibres from the dorsal region of the third metatarsal, and so becomes a dorsal interosseus. Its suppressed neighbour on the tibial side of the third toe appears, accordingly, only on the plantar aspect, and is relegated to the plantar series by this difference in the two limbs; a certain number of fibres, which in the hand serve to adduct the middle finger to the pollex, are in the foot made subservient to the abduction of the second toe from the hallux. This transfer of fibres from adductor to abductor function is, as I have just said, probably to be associated with the immobility of the hallux, and the consequently lessened range of adduction permitted to the several toes, in comparison with the fingers.

The lumbricales are curious and interesting and rather puzzling features in myology. They are very commonly present in lower animals, as well as in Man. They arise from the deep or the superficial aspects of the deep flexor tendon, or from both aspects; and their origin may extend into the clefts between the divisions of the tendon. They may be divided, so as to exist upon both sides of each digit; or the fibres may be combined and pass to one side only. When they are thus confined to one side, that side is usually, as in ourselves, the pre-axial side. They may be inserted into the proximal phalanges, or into the

margins of the extensor tendons. They are to be regarded as derivatives from strata which in some instances are superficial to, and in others are deeper than, the flexor tendons. Accordingly, in those animals, in which they lie upon the superficial aspect of the deep flexor tendons, they associate themselves rather with the flexor sublimis; and, when they lie upon the deeper aspect, they associate themselves rather with the interosseal or the short flexor group.* Their limitation to the pre-axial side may be for the purpose of counterbalancing the effect of the deep extensors, which, including the intermediate extensors, are usually connected with the post-axial side of the extensor tendons. Their passage directly from the flexor to the extensor tendons is remarkable, and seems to indicate that one of their functions, at any rate, is to harmonise or balance more nicely than could otherwise be done the antagonistic action of the flexors and extensors of the digits, as well as to brace more particularly the extensor tendons during the sudden and rapid action of the flexor muscles. To them we are probably in part indebted for the rapid yet steady and exact movement of the digits which we possess, and which is so essential a feature in delicate manipulation.

The vincula tendinum are probably the representatives of the intrinsic muscles of the phalanges—the phalangeal muscles of Batrachians—which have retained a connexion with the phalanges at one end only, and have become connected with the flexor tendons at the other end. In the Bird's foot, they are elastic. They seem in them to serve the purpose of assisting to draw the flexor tendons towards the phalanges, and of keeping them in contact with the phalanges during the extension of the digits.

In the following attempt at a plan of the superficial and deep muscles, the names of the corresponding muscles of the upper and of the lower limbs are placed in juxtaposition; and those of the lower limb are in italics. In some instances, as in the case of the accessorius, no equivalent to the muscles in the one limb can be indicated in the other.

MUSCLES OF LIMBS.

Superficial.

Palmar and Plantar Pectoralis = *Gracilis*
,, minor

Biceps (Glenoid) = *Semimembran.*
,, (Coracoid) = *Semitendin.*

Pronator teres
(superficial part)
Palmaris longus
Flex. carpi rad.
,, uln.
,, dig. subl. } = { *Gastrocnemius*
(inner head).
Soleus.

Dorsal Deltoid = { *Sartorius*
Tensor vag. femor.
Latissimus d. = *Gluteus max.*

Triceps (Scapular part) = *Rectus*
femoris

Supinator longus
Ext. carpi rad.
,, digit. sublimis
,, carpi uln. } = { *Tibialis ant.* (superficial part).
Ext. dig. subl.
Peronci.

Deep.

Palmar and Plantar Supraspinatus = *Iliacus*
Subscapularis = *Obturator int.*
Coraco-brachialis = *Adductor long.*
,, *med.*
,, *brev.*
Pectineus
Gemelli
Quadratus fem.

Brachialis ant. = *Biceps* (fem. part)

Pronator teres (deep part) = *Popliteus*.
Flex. c. rad. tendon of } = { *Tibialis post.*
Flex. dig. prof. } = { *Flex. dig. prop.*
,, long. pollicis } = { *hallucis.*

Accessorius.

Dorsal Infraspinatus } = {
Teres minor } = {
Teres major = *Pyramiformis*

Triceps (humeral part) = *Quadriceps*
(femoral part)
Biceps
(pelvic part)

Supinator brevis
Supinator manus
(alias ext. met. poll.) } = { *Tibialis ant.* (deep part).
Ext. primi internod. poll. } = {
Ext. 2di. internod. poll. = *Ext. hallucis.*
Ext. indicis
,, minimi digiti
Ext. prof. (alias *brevis*) *dig.*

Finally, the question suggests itself as to the distinction to be drawn between a hand and a foot from a comparison of the muscles in the two.

In a paper reported in the *Proceedings of the Royal Society*, xviii, p. 359, Dr. Haughton endeavours to establish a difference between a hand and a foot, as shown by their flexor tendons. He argues that, as there is friction to be overcome at the wrist and the ankle, the tendons will be thicker, stronger, and heavier, in each instance, between the end at which the force is applied and the seat of the friction, than on the other side of the friction. He further maintains that, in the case of the hand, the flexor muscles of the forearm act upon the finger-tendons in a direc-

tion from the muscles towards the tendons; and that, as the forces are diminished by friction at the wrist, we should expect the strength of the tendons above the wrist to be greater than below it. Conversely, in a proper foot, he conceives that the force is applied by the ground to the extremity of the tendons of the toes, and is transmitted to the muscles of the leg by means of the tendons of the inner ankle, which undergo friction in passing round that and the other joints of the foot. In this case, therefore, he says, we should expect the united strengths

* See account of these muscles in the *Uromastix spinipes*, in my *Observations on Myology*, p. 64.

of the flexor tendons of the toes to exceed the strength of the flexor tendons above the ankle. He adduces various observations in proof of these propositions. Without staying to question the correctness of the grounds upon which this difference is based, and of the view which conceives the force to be applied by the ground and transmitted through the tendons to the muscles in the leg, I may state that I have very carefully weighed equal portions of the tendons taken at the wrist, as well as above it in the forearm and beneath it in the hand, in the human subject, and found no difference whatever. The three portions weighed precisely alike. The same was the case with equal portions of the tendons taken at, above, and beneath the ankle. If there was any difference, the balance was slightly against Dr. Haughton's view, as it gave a trifling preponderance to the portion of the flexor longus pollicis taken from above the ankle. I confess I should have been rather surprised if the experiment had corroborated this view of the mode of distinguishing between a hand and a foot.

In discussing this question, it is necessary to eliminate the features of difference usually observable between the distal parts of the fore and the hind limb; forasmuch as they relate to the distinction between the two limbs, and have no relation to the distinction between a hand and a foot as applied to either of the limbs. This preliminary has not always been sufficiently attended to; and the comparison has therefore been made, as it appears to me, upon quite a false basis. Thus, the talented author of *Man's Place in Nature* observes that the foot of Man is distinguished from his hand by the following absolute anatomical differences: 1. By the arrangement of the tarsal bones; 2. By having a short flexor and a short extensor muscle of the digits; 3. By possessing the muscle termed peroneus longus. Making these the basis of comparison, Professor Huxley then argues that the termination of the hind limb of the Gorilla presenting these features of the foot, is to be regarded as a foot, and not as a hand. But it is evident that these are the characters, not of a foot as distinguished from a hand, but of the terminal part of the hind limb of a Mammal as distinguished from the terminal part of the fore limb; and they accordingly characterise the hind foot of most of the other Mammals, and distinguish it from the fore foot, as much as they do in Man or the Gorilla. They have, therefore, no especial relation to the question of discrimination between a foot and a hand, and should not enter into our computation in determining that question. We must first consider what features in the terminal part of a limb characterise the hand; and we may then apply the term to the part in which we find those features present, whether it be in a fore limb or a hind limb, quite irrespectively of any modification in the other features of the limb. The term is derived from Man; and we recognise at once that the great features of the hand are the mobility and relative length of the phalanges, and the mobility of the first digit upon the carpus. The carpus remains much as in other Mammals, and the muscles show very little difference. The chief differences in them are, first, that the flexor longus pollicis is segmented from the flexor digitorum. This, however, be it remarked, is found in the most perfect hand of Man only, and not in the hand of the higher Apes; and, indeed, the segmentation is not infrequently incomplete in Man. Secondly, the supinator manus becomes, by its more or less separate attachment to the movable metacarpal bone of the pollex, an extensor ossis metacarpi pollicis, and an extensor primi internodii pollicis is present. This latter is not found, or is but rarely found, in the Apes;* and it is occasionally wanting in man. Thirdly, the opponens pollicis and the opponens minimi digiti are distinctly segmented muscles. Fourthly, the interossei adduct and abduct to and from the middle digit. A corresponding modification in the terminal part of the hind limb would in like manner constitute a hand. In none of these points does that part in Man present such a claim. But if we examine it in the Chimpanzee, we find that the requisite modifications, or many of them, are present. The phalanges are relatively long, though they are somewhat less freely movable than in the hand of Man. Digit 1 is set off from the others, and is freely movable upon the tarsus. The tarsus retains the ordinary mammalian tarsal features, just as the carpus in Man retains the ordinary mammalian carpal features. With regard to the muscles, the flexor hallucis is nearly, and in other Apes quite, as free from the flexor digitorum as is the corresponding muscle in the fore limb of the same animal. The extensor ossis metatarsi is a distinctly segmented muscle, acting upon the hallux in the same manner as its homologue acts upon the pollex; that is to say, its individuality, or separateness as a muscle, is correlated with the mobility of the metatarsal bone, much as the attachment of its serial homologue to the metacarpal is correlated with the mobility of that bone in the upper limb. The opponens minimi digiti is, in some instances at any rate,† a distinct muscle. Even

an opponens hallucis is described in the Gorilla and Macaque by Duvernoy and Halford,* and in the Orang by Huxley,† though in most of the Apes it appears not to be present. Its absence can be no cause of surprise, forasmuch as the movement it is calculated to effect, and which is performed by the corresponding muscle in the fore limb, is in the hind limb more effectually performed by the peroneus longus; and this muscle is, as it were, ready made for the purpose in the ordinary hind limb, and requires no alteration for its special manual functions. The interossei adduct and abduct to and from the third digit, as in the hand, and not, as in the ordinary mammalian foot, to and from the second digit; and this appears to be generally the case in the Apes. It is in addition worthy of remark, that an extension of the adductor hallucis, and the separation of a portion of it, forming the transversus pedis, as in the foot of Man, does not usually take place in the hind limb of the Ape;‡ moreover, the flexor accessorius is often absent. The two last named muscles, however, are perhaps rather appurtenances of the hind limb than of either the foot or the hand. To require that the other muscles—viz., the short, or rather superficial flexors and extensors of the digits, as well as the peroneus longus, and also the tarsal bones—should be modified into accordance with similar parts in the human hand, would be to require modifications much greater than those which the human hand itself presents, if it be compared with the corresponding part in the ordinary mammalian fore limb.

Judged by the test I have given, and which I think is the true one, the muscular structures agree with the other structures in proving that the terminal part of the hind limb of the Chimpanzee has quite as strong a claim to be defined a hand as has the terminal part of the fore limb of the same animal. Other reasons than have yet been adduced must be forthcoming before we can relinquish the appellation "quadrumanous" as correctly belonging to this animal and its allies, and before we need deny to Man the prerogative of special subdivision of labour in the parts of his frame, and of consequent high organisation, which is significantly implied by the term "bimanous".

USES OF CHLORIDE OF AMMONIUM.

THE chloride of ammonium I consider to be a very useful remedy; but, because of its very disagreeable taste, as well, perhaps, as on account of its being an old (and therefore apt to be forgotten) drug, it has not been used internally so much as its usefulness would seem to indicate. Its diaphoretic action is equal to its diuretic. It has been for a long time used more or less, especially on the Continent, in ascites. But it appears to have a special action on serous membranes generally; and I have found it very valuable in effusion into the pleura, especially when its cause is of a subacute or chronic character. Some time ago, I recorded a case of chronic hydrothorax where the effusion was very abundant, and occurring in a delicate woman, who ultimately died of phthisis. Under the use of the drug, rapid absorption took place. Since then, I have tried it in one or two other cases of a similar nature—the effusion resulting from subacute pleurisy. One of the cases occurred in a scrofulous boy, the whole of whose left chest was filled with fluid, which rapidly disappeared after taking the chloride in fifteen-grain doses every four hours. It is necessary to give to adults from twenty to thirty grains every three or four hours, in order to get its full benefit. Its precise *modus operandi* has not been clearly ascertained. Although primarily not a stimulant, it may act on serous membranes by stimulating their power of absorption. Its diaphoretic action may account for its efficacy in muscular rheumatism, in which affection I have used it very extensively, and have found it to give more relief than any other remedy I have tried. I have had personal experience of its good in muscular rheumatism coming on after scarlet fever. In these cases, also, it requires to be given in half-drachm doses. I have not found it of much use in lumbago or articular rheumatism. Some bitter infusion is the best thing to disguise its taste. I tried it mixed with sugar; but that, though it disguises its salt taste, makes it rather nauseating. With Dr. Thomson, I think this drug is deserving of further trial in other diseases, as well as in those above-mentioned.

JNO. DEWAR, L.R.C.P.E., etc.

132, Sloane Street, S.W., July 15th, 1872.

* *Lines of Demarcation between Man, Gorilla, and Macaque*, p. 20.

† *Medical Times and Gazette*, xxviii, 59. It has not, I believe, been found in the Chimpanzee.

‡ The transversus pedis was found in the Chimpanzee and Gorilla by Huxley and Flower (*Medical Times and Gazette*, xxviii, 428, 538).

* It is said to have been found by Rolleston in a Chimpanzee (*Journal of Anatomy*, vi, 184).

† Champneys, *Journal of Anatomy*, vi, 206.