The muscles of the posterior extremity of the horse and other domestic quadrupeds, with the synonyma to human and veterinarian authors

The MUSCLES of the posterior Extremity of the HORSE and other Domestic Quadrupeds, with the Synonyma to Human and Veterinarian Authors.

Quis vituperationi det id posse curare, quod laudi ducitur possidere?
VEGETIUS, lib. i.

THESE dissections and remarks were made in my very early studies, at the opening of the Veterinary College about the year 1793, and were contributed to Dr. Rees's Cyclopædia about the year 1808, of which the following, with a few alterations is nearly a transcript.

On dissecting the muscles of a man's thigh and leg, and those of the thigh and leg of the horse, and comparing them together, the dissimilarity has been found so great, that it would only create confusion to apply the same names to both; where they agree, we gladly embrace the same names, but where they are not at all alike, we do not attempt to make them appear so, by imposing the same names, but have given them names expressive of their situation, attachment, or shape. Where the comparison between the human and the horse was doubtful, we have taken some intermediate animal, not so distantly removed from man in structure, by which we could more easily detect the coincident part, and transfer it more securely to the horse.

The different movements of the hind extremity of the horse are performed by the means of about thirty-two muscles: 15 proper to the thigh; 3 to extend; 3 to bend it; 4 termed adductors; and 5 called rotators.

2 common to the thigh and leg; 1 to bend and turn them inwards; one to extend and turn them outwards.

8 proper to the leg; 3 extensors; 2 flexors; 3 adductors.

2 proper to the hock and shank; 1 to the os calcis, called an extensor; and the other to the anterior side of the head of the shank, called its flexor.

1 to the coronet, bending it backwards.

4 to the foot; 1 extensor; 1 flexor; and their lateral muscles, one to each.

The 15 muscles of the thigh appear to be distributed as follows:

Glutæus externus
magnus
parvus
} To straighten the thigh, by drawing it backwards, or rather for moving the body forwards to the limb already carried forwards by the flexors and resting on the gronud as a fixed point.

Psoas magnus
Iliacus major
minor
} Flexors, advancing the thigh forward.

Adductor teres
magnus
parvus
Musculus fasciæ latæ
} From their situation, they appear to act as drawing the thigh and limb closer to the body, but probably in conjunction with the common muscles on the opposite side, which terminate about the stifle; they are thus cooperating in the great general purpose of removing the body.

Obturator externus
internus
Pyramidalis internus
M. parvus articulationis
Gemelli
} Termed *rotators*, a purpose they cannot serve in this animal. They appear to cooperate, according to their situation and direction, with the muscles above enumerated. The obturators compress the contents of the pelvis apparently.

The uses assigned to these muscles by human anatomists, much of which would be useless almost to the brute, convey, we conceive, but a feeble idea to the mind of the student of their real purposes. In the horse their uses are more striking and strongly marked, which suggested to the author the explanation of their effects here given, though we are convinced much more remains to be done than has been hitherto, to arrive at satisfactory details on this complicated and interesting subject.

Previous to entering on a description of these muscles, it may be well to advert to a description of the thigh bone more especially, previously given in the Osteology, to which we must refer the reader.

Glutæus externus.—This muscle lies the most exteriorly of all the muscles of the buttock, and is of a small size: it extends from the second and third spin-

ous processes of the sacrum to the anterior angle of the inferior *ramus* of the ilium, where it joins the *fascia lata;* from thence it extends to the *processus recurvatus externus* of the thigh. This muscle is surrounded on all sides by *aponeurosis;* that on the superior part, covering over the muscles of the rump, is affixed to the spinous processes of the loins; the aponeurosis of its posterior part passes underneath the *sacrotibialis externus,* to which this muscle is contiguous in passing to the external curved process of the thigh.

The glutæus externus is so small in quadrupeds, that a doubt might arise whether this was not a part of the *fascia lata,* and the muscle beneath it the corresponding one to the *glutæus maximus* of the human anatomy. From a farther investigation of this subject, we believe that not to be the case, and that it is the real representative of the *glutæus maximus.*

The singular diminution of this muscle in the quadruped, may be, perhaps, explained on the following principles of the difference of structure necessary to the two animals. In the man, an erect animal, the legs have to perform a greater variety of motions, as abduction, adduction, rotation, &c. which the horse, whose motions are principally confined to going straight forwards in a line, does not require, so we see this great abductor of the human anatomy becoming comparatively a very small one in this animal, while the muscles of the rectilinear progression are vastly increased in bulk, as we may see by looking on the *glutæus medius,* which is the *maximus* of the horse in point of size, and, from its attachments, is evidently a direct extensor of the thigh. Others might say the externus was diminished on account of the increase of the purchase obtained by its insertion into the extended point of the curved process of the thigh being taken farther for the centre of motion, which would compensate for its want of size and power; for it seems pretty nearly the same thing whether we make a muscle very large, or give it a powerful insertion; sometimes bulk, sometimes power only is necessary; but the consideration of the circumstance in which power should be obtained by accumulated muscular fibres, or by favourable insertion would lead us beyond our present purpose. It is these actions under an erect position that causes probably the difference in us.

This point once admitted, viz. that it is the *glutæus maximus* of the human body, the others follow naturally, and admit of a nearer comparison; and the anatomy of the thigh of the dog, which has no curved process, would seem to confirm this opinion.

Its use.—The direction of this muscle seems to point it out as an abductor; the best way, however, of considering it is to regard it in this animal as a *tensor aponeurosis* of the buttock, assisting the other muscles of this part, by its gentle compression and springing elastic reaction, to their motions.

In the ox, it exists with pretty much the same characters.

In the dog, it is much larger than in the horse, *cæt. par.* and more fleshy, having a strong attachment to the sacrum underneath the muscles of the tail, and terminating in the back of the thigh by a long tendon.

In the cat, the same as in the dog; but here it might well be denominated the glutæus posticus.

Synonyma.—*Stubbs,* Anat. Horse, p. 23, *Tab. II. m, n, o, o, p.* Glutæus externus.

Lafosse, Cours d'Hippiatrique, p. 118. Le moyen fessier. Lafosse, Dictionnaire, p. 456.

Bourgelat, Elémens d'Hippiatrique, p. 278. Le petit fessier extenseur de la Cuisse.

Vitet, tom. i. p. 181. Le fessier externe.

Winslow, Exposition Anatomique, p. 135. Le grand fessier.

Glutæus magnus, seu maximus, omnium auctorum humanæ anatomiæ.

2. *Glutæus medius.*—This vast muscle lies immediately under the preceding, occupying great part of the upper surface of the ilium. It takes its rise by a point on the lumbar muscles, growing more fleshy as it reaches the ilium; it takes a strong adherence, by fleshy fibres, to the external angle of the inferior *ramus;* after passing the ilium it becomes smaller, and dividing itself into two bodies, one terminates on the superior, posterior trochanter, the other by a very strong tendon on the inferior external trochanter, and which is covered by the tendon of the external glutæus. This muscle may be divided into two distinct parts, one of which might be considered by some as the maximus of the human; however, the nature of its attachments seems fully to prove its agreement with the *medius.* It is the weightiest muscle perhaps of the whole body

Its use.—To draw back the thigh, or (the leg being made a fixed point on the ground) to advance the body upon it.

In the *ox.*—This muscle is more distinctly divided into two bodies, nor does it pass so far over the muscles of the loins. Is not this muscle a chief contributor to the buttock of beef, where it takes its rise on the lumbar muscles, at the place of the commencement of the sirloin, which takes a share of the longissimus dorsi muscle? There is also a small, almost linear, muscle not found in the horse.

In the *dog.*—It is not at all attached to the muscles of the loins, but fills up the ilium entirely, and terminates on the posterior trochanter; and in the cat the same.

Synonyma.—*Stubbs,* Anat. Horse, p. 18, tab. 3, *a, a, a, b, b, b, c, d.* Glutæus medius.

Lafosse, Cours d'Hippiatrique, p. 18. Dictionnaire, 457.

Vitet, Médecine Véterinaire, i. Le grand et le moyen fessier.

Bourgelat, Elémens d'Hippiatrique, p. 278. Le grand fessier.

M. Sainbel, first professor of the Veterinary College of London, in his lectures, principally adhered to the names and arrangement given by Bourgelat.

Douglas, Myographia comparata, p. 130 Glutæus medius.

Winslow, Exposition Anatomique, p. 329. Le moyen fessier.

Glutæus medius omnium auctorum humanæ anatomiæ.

3. *Glutæus parvus.*—This is a short, strong (and though small, compared with the former) not inconsiderable muscle, of a square figure, lying immediately over the joint; it takes attachment round the posterior ramus of the ilium; passing over the head of the femur it fills the anterior concavity formed by the superior trochanter of the thigh.

Its use.—It operates in the combined effect of extending the thigh. Its position is that of an abductor. These glutæi muscles appear to be employed to draw the body to the advanced limb carried forwards by the adductors and the sacro tibialis muscles, the ilium performing in some degree the office of pulley block in diverging their direction from a straight line, and thus increasing their power.

In the *ox* nearly the same. Le petit fessier. *Vitet*, p. 185.

In the *dog*, it is of a different shape, being more pyramidal, and attached at the anterior superior part of the thigh.

In the *felis*, it is attached to the inferior and posterior ramus of the ilium, and terminates at the anterior part of the thigh in a nick or excavation.

Stubbs, Anat. Horse, tab. 4, *h*, *i*, *k*, *k*, *k*, *l*, *l*.
Vitet, Med. Vet. p. 181. Le petit fessier.
Lafosse, Cours d'Hippiatrique, p. 118. Dictionnaire, p. 457. Le petit fessier.
Bourgelat, il n'a rien dit la dessus.
Douglas, Myologia comp. p. 131. Glutæus internus.
Winslow, Expos. Anatomique. Le petit fessier.
Glutæus minor, *Albinus*. minimus, *Innes*.

4. *Psoas magnus.*—On removing the intestines from the abdomen and peritoneum, this beautiful muscle presents itself; it is attached to the inside of the two last ribs, and to the transverse apophyses of the lumbar vertebræ; passing to the edge of the pelvis, it joins the iliacus, and is with it inserted into the little trochanter, running between the iliacus major and minor: this muscle can never be mistaken for any other in any animal; it is rather depressed at its origin, but becomes cylindrical and pointed going to its termination; this muscle, near its insertion, is confined by a ligament which binds it and the iliac muscles in their situation.

The *psoas parvus* we consider as a flexor of the loins, by bending the pelvis (to which it is always attached) on the lumbar vertebræ.

Veterinary writers have mostly described this muscle as belonging to the thigh; it, however, generally terminates where the sartorius begins, forming together a digastric muscle of great length.

Ox, nearly the same.

Le grand Psoas. *Vitet*, p. 188.

Dog.—It is attached to the four last lumbar vertebræ, is vastly larger, and more fleshy in proportion to the animal; it terminates in the same place: but the iliacus parvus, we may observe, does not in this animal terminate where the sartorius begins, for this muscle rises from the anterior angle of the ilium.

In the *cat* there are three very distinct muscles of this description.

Vitet. Med. Vet. Le grand Psoas, i. 179.
Lafosse, Cours d'Hippiatrique. Le grand Psoas, p. 117. Dict. 455.
Bourgelat, Elémens d'Hipp. Le Psoas, 281.
Stubbs, p. 18. tab. 9, *a*, *a*, *b*, p. 34.
Psoas magnus omnium auctorum hum. anat.

5. *Iliacus major.*—This muscle takes attachment to the whole inferior *ramus* of the ilium, growing cylindrical, and tapering, it is joined to the *psoas magnus*, passing with it through Poupart's ligament to the little trochanter of the thigh.

In the *ox* it is more intimately blended with the iliacus parvus.

In the *dog* it is remarkable that this muscle is entirely wanting. The ilium is elevated so far above the lumbar vertebræ, that the muscles of the back occupy its place: it is singular, that this circumstance should have escaped the notice of Douglas, who has expressly treated of the anatomy of this animal.

In the *felis* the same as in the dog.

Stubbs, Anat. Horse, p. 18. tab. 3. tab. 9, p. 34.
Lafosse, Cours d'Hippiatrique, p. 117. Dict. Hipp. 455.
Bourgelat, p. 281. Elém. d'Hipp. L'Iliaque.
Iliacus internus, auctorum hum. anat.

6. *Iliacus minor.*—This muscle, which in general, is quite separate from the iliacus major, takes its rise from the inside of the first sacral apophyses all the length of the posterior ramus of the ilium; passing over the head of the femur, it terminates with the psoas and iliacus on the little trochanter; it permits the psoas to pass between it and the iliacus major, and might be considered as a portion of the latter; it is connected by aponeurosis with the muscles which line the pelvis, and traverses the insertion of the gemini.

These three last muscles have all the power of bending the femur; the two last on the pelvis, the psoas on the loins, bending both femur and pelvis.

Ox.—Not a distinct muscle.

Dog.—Is altogether wanting, but appears to be compensated for by having three psoas muscles.

Cat.—The same as in the dog.

Lafosse, Cours d'Hippiatrique. *Planche*, 22. Dictionnaire, p. 456.

7. *Adductor teres*, is a cylindrical muscle, which makes its appearance on the inside of the thigh; the integuments being removed, it takes its rise on the os pubis, near the symphysis, attached to the same ligament with the rectus abdominis; it terminates, along with the adductor magnus, about half-way down the inside of the thigh, or rather on the back part of this bone.

Stubbs, Anat. Horse, tab. 5. *s*. *s*. Le pectineus.

Lafosse, Cours d'Hippiatrique, p. 118. Le pectineus.
Vitet, Med. Vet. p. 180. Le petit pectiné.
Bourgelat, Elém. Hipp. Le pectineus.
Douglas, Pectineus, p. 153.

Comparison of this muscle with the human pectineus.—We see by its attachments that it is by no means the same muscle; it is much more nearly allied to the triceps adductor primus, which it also differs from; it rises too near the symphysis instead of the brim of the pelvis to be the pectineus, and terminates by insertion, along with the large adductor, low down the thigh; it is also a more external muscle than the pectineus; but as there is no real pectineus in the horse, nature seems to have united in this one muscle the properties of the pectineus and adductor longus, so that we have chosen to call it by a different name from either, viz. *adductor teres.*

The *ox* has a much flatter muscle, and sends off a slip to the ligaments of the knee, or stifle, patella.

Dog.—This muscle is rounded, and much resembles the human long head of the triceps.

The cat.—There are four adductors, one of which resembles more nearly the human pectineus.

Adductor magnus.—There are three distinct muscles of this description in the horse; this portion of it is seen very distinctly by removing the adductor planus of the leg, taking attachment to the symphisis pubis, it extends down to the posterior and inner part of the thigh, and sending off another portion which is attached to the tibia, or rather to the joint of the femur and tibia by a flat tendon. This muscle may be divided into two portions; one has been called by veterinary writers *la portion moyenne*, the other *la portion antérieure;* but this we consider as unnecessary and unnatural; for after such division it does not correspond to the three portions of the triceps muscle in the human. See our large coloured section, numero 88, a fine figure it.

Stubbs, Anat. Horse, p. 18, 15, 36, 36, 36, &c. tab. 3. p. 46, tab. 14. *p, p, q, r, s, t.*
Lafosse, Cours d'Hippiatrique, le gros et le moyen extenseur, p. 117. Dict. 454.
Bourgelat, Elém. Hipp. p. 282. triceps.
Vitet, Med. Vet. La portion antérieure et moyen du triceps crural, p. 182.

Comparison with the human.—On actually comparing this muscle with those of the human thigh, it is difficult to decide whether it most resembles the short or great head of the triceps, but it certainly is not much like either of them; therefore, to prevent confusion, we have given it a different name, and left out the term triceps altogether; this muscle and the *sacro-ischio tibialis internus*, both agree in some points with the great head of the triceps, and differ in others. Stubbs considers it one, and the French writers the other; in this confusion I think it best, for distinctness, to avoid the comparison, and give it a name that will not interfere with either.

Dog.—This muscle lies underneath the long head of the triceps, and is the largest of the extremity.

Cat.—In this animal the artery perforates the tendon of the *adductor magnus*, as it does in the human body, to pass to the gastrocnemius, which serves to identify the muscle in this animal.

Ox.—No such portion appears.

9. *Adductor brevis seu quadratus.*—This muscle lies immediately underneath the former, and is of a linear figure, being throughout of nearly equal size, rising on the *os ischium* near the edge of the *foramen ovale;* it takes an oblique direction, and terminates on the posterior flat part of the thigh, on the back of the posterior trochanter.

Ox.—It exists of the same figure. *Vitet.* L'Ischio-crural, p. 186.

The *dog* possesses it, and also a muscle which exactly corresponds to the short head of the triceps in the human.

Stubbs, Anat. Horse, tab. 15. p. 47.
Vitet. Le rond. p. 183.
Lafosse, Cours d'Hippiatrique, p. 117. Le petit extenseur. Dict. 454.

10. *Tensorius*, or *M. fasciæ latæ.*—This is considered by some as a muscle of the leg, by others of the thigh; in this animal, however, it is common to both, and might be very well placed with the common muscles before mentioned. This muscle often varies in figure, but is generally of a triangular shape, formed of two or three fleshy bodies. The superior point of the triangle is affixed to the os ilium on the exterior angle of the inferior ramus. Its posterior point is affixed to the *processus externus curvatus* with the *glutæus externus*, with which it forms an intimate union. Its inferior angle terminates by aponeurosis which covers all the muscles inside the thigh on its anterior part, extending also over the patella, and tibia.

Ox.—This muscle not so completely divided into two portions.

Dog.—Besides this muscle there is another strong muscle above it, and which has been noticed by Douglas. Myolog. Comp. 164. *Fascia lata superior*

Cat.—The same as in the dog.

Stubbs, Anat. horse, tab. 2, fascia lata.

Lafosse, Cours d'Hippiatrique, p. 120. Le fascia lata abducteur de la jambe.

Vitet Med. Vet. p. 180. Lileo-crural.

Bourgelat, Elem. d'Hipp. abducteur de la cuisse.

Tensor vaginæ femoris, Innes et aliis.

Obturator externus.—This is a pretty considerable muscle, extending its fleshy fibres from the symphysis of the pubis over the foramen ovale. Its fibres concentrate as they approach the hollow on the back part of the great trocanter of the thigh, into which they are inserted. This muscle is separated by a very thin ligament, from the internal obturator, which has the name of ligamentum Thyroideum, and the nerve going to the adductor magnus, passes through it. Name from *obturo*, to *stop up*.

Use.—To draw the thigh, its posterior part, towards the anterior part of the pelvis, and of course to turn its anterior and lower part outwards.

Ox.—Vitet obs. that in this animal the internal and external obturator form but one muscle, of two plans of fibres. It may be divided into two portions, an anterior and posterior, they both terminate at the same point, one above the other.

Dog.—In the dog and *cat* the same.

L'obturateur externe, Lafosse Cours d'Hip. 118. *Dictionaire raisonné*, 458.

Vitet Med. Vet. 182. Bourgelat L'obtur. ext. Stubbs Obtur. externus.

Douglas takes no notice of it in the dog.

Obturator internus.—This is a thin fleshy expansion on the inside of the pelvis over the *foramen ovale*, its fibres, collecting together, pass over the *ramus* of the Ischium, and its tendon, passing over the tendon of the *Gemelli*, is terminating in the same place with the former.

Use.—I consider this as rather a muscle of the pelvis than of the thigh, it can have little action on so large a member, but when it contracts into a straight line, it will compress the contents of the pelvis so as to evacuate them.

Ox.—This and the former appear to form but one muscle, there being no ligament between.

Dog.—It is very strong in the dog, perhaps, on account of his hard fæces.

Cat.—Quite as strong as in the dog.

Pyramidalis or Pyriformis.—This muscle, if intended to be the same as the one in the human, bearing that name, does not exist in the horse, but it does very finely in the dog. There is a muscle, however, running down the inside of the posterior *ramus* of the ilium which St. Bel used to call pyramidalis, which seems to be the *pyramidalis* or *pyriformis* of the French writers, though it is quite a distinct muscle from the human, and exists in the dog as well as the true *pyramidalis*.

Pyramidalis internus.—This is a thin expanse of muscular fibres, lining the posterior ramus of the ilium, its fibres meeting together terminate by a pretty strong tendon with the obturator internus, in the same depression in the back of the thigh bone; it extends upwards as far as the first transverse processes of the Sacrum, so that by mere description, without seeing the muscle, one might take it to be the human pyramidalis. Is it proper to consider this indeed as truly distinct from the obturator internus?

Use, acts with the other in compressing the contents of the pelvis.

Lafosse Cours d'Hippiatrisque, 118.

Bourgelat, Le pyriforme.

Vitet has not described it, or Stubbs, who seems to have given a portion of one of the Glutei muscles for it, see p. 42.

Dog.—Where it exists, but what is remarkable, it does not pass to the thigh, as in the horse, but to the muscles of the coccyx crossing the pelvis, it is a very strong muscle.

Articularis.—This small muscle is very likely to be destroyed in dissecting the glutæi, or the patellaris anterior; when dissected with care we see a very complete distinct little muscle, no way connected with any other, having a rounded fleshy belly, and tapering to each end. It rises by fleshy fibres on the posterior ramus of the ilium, its inferior part underneath the tendon of the patellaris anterior, it passes over the joint in the nitch or neck of the head of the femur, and neither Lafosse, Bourgelat, or Vitet have described it.

Douglas, *musculus parvus in articulatione situs*, p. 161.

Stubbs has followed Douglas in the same name, p. 47, plate 15.

Use.—Winslow supposes it prevents the capsular ligament from being pinched, we do not venture a suggestion; it is too small to operate where it is situated, in the centre of motion, in the motions of the limb, with much effect.

Gemelli.—On removing the tendon of the obturator internus we see two muscles underneath it, passing across each other, from the external ridge of the Ischium, to the hollow in the back of the head of the femur, one larger than the other, it requires a careful dissection not to destroy them. They do not appear strictly to agree with the same, so named in the human, though similar in attachs and situations, enough so to receive the same name.

Use, same as the Obturator internus.

Ox.—There is one only of a pyramidal shape, lying above the obtur internus. Vitet, le pyramidal, it has not, however, any of the characters of the pyramidalis, not being attached to the sacrum, and terminating with the obturator, which the pyramidalis does not.

Lafosse, Cours. *L'Ischio*, Dict. p. 458.

Bourgelat, les deux jumeaux.

Vitet, le quarré. Stubbs' Gemini, plate 5, 13, 14.

We do not conceive these muscles, scarcely any of them, ever act separately, but in combination with others. We cannot have an idea of the use of abductor and adductor motions of the limbs of the horse, singly considered, a horse rarely or never having use for them in this way; the only motion a horse has to make in a general way, is to go forward in a straight line nearly, making perhaps a small curve outwards, which, acting in both limbs, at the same time corrects itself and preserves a rectilinear direction. And this motion, outwards, will serve also to prevent any interference of the two limbs inwards, towards which they would probably otherwise gravitate. And this forward motion is not effected as generally imagined, by flexors and extensors only, the abductors and adductors lying idle masses the while, or merely steadying the limb, as others say, but are actually promoting the progression forwards in a most essential manner, which important principle is farther developed at the conclusion of the description of the framing of the horse, and seen with his section, p. 11, 12.

Of the Patella, Tibia, and Fibula.—The patella is an irregular mass of bone, neither square nor round, convex on its outside, concave on its inside, with a ridge internally for passing between the condyles of the thigh bone. It is held to the tibia by strong ligaments, and to the thigh bone, by muscle. Its ligaments are four, two to the inside, attached to the femur, one anteriorly to the top of the tibia, and one external. The patella gives great power, like a pully block, by removing the motor powers, viz. the muscles, farther from the centre of motion, making the attachments of the muscles form a considerable angle with the head of the tibia, and is facilitating this motion of the tibia very much, aided by its highly lubricous, or smooth cartilaginous surfaces inside the bone.

Ox.—The most striking difference in this animal is the entire want of the fibula. The hog, however, has both tibia and fibula, the latter singularly forming an oblique line to the former, from top to bottom, perhaps, for routing over the ground in search of food; the boar, however, scoops and rips up the ground, as we have observed on Mount Jura, with his tusks principally.

Dog.—The patella is double.

The tibia, we may remark, corresponds in figure more with the human than the thigh bone does, though, it is also *cæteris paribus*, considerably shorter, as is the femur also, than the human, and is not so sharp on its anterior upper edge, which part may be called its *anterior Crista*. The external side of it is concave, in which lie the bodies of several muscles; its internal side is convex, and the ligaments appear all attached to the epiphysis, none to the bone itself, in the young animal at least. Its back part is flat. Its epiphysis may be divided into two condyles, an external and internal. From the external arises a small thin bone, which is corresponding to the human *fibula*.

The inferior extremity of the tibia is flattened before and behind, having below a double hollow of articulation, for articulating with the *astragalus* of the tarsal bones.

Dog possesses a distinct fibula, and so does the *cat*, for the purposes of convenient rotation.

MUSCLES OF THE PATELLA, TIBIA, AND FIBULA.

Extensors.	Patellaris externus
	. . . internus
	. . . anterior
	. . . subterior
Adductors.	Adductor planus
	. . . longus
	. . . poplitœus
	Sacro-tibialis exterior
	. . . . posterior
	. . . . interior

Patellaris externus.—In man it is much longer, and very thin in other respects, like that of the horse. There are two muscles, indeed, which cannot be very well separated. This muscle covers the whole external part of the thigh bone. It is attached to the great trocanter, exteriorly, and to the neck of the femur, and passing downward it entirely fills up the *processus externus recurvus*, taking a fleshy adhesion all the length of the thigh to the *linea aspera*, uniting inseparably, with the other two patellares muscles in surrounding the patella.

Use.—To extend the leg by drawing upon the patella, which acts the part of a pully block, in forcibly extending the limb.

Dog, cœteris paribus, much as in other animals, *cat* the same.

Patellaris anterior.—These two muscles being inseparable we shall describe them as one, an object, however, in dividing them is not to have too great a mass of flesh under one name, and that we might describe more precisely the situation of blood vessels, and nerves.

These three muscles to which are given the name of vast generally, and which cover the sides and anterior part of the femur, forming a handsome plumpness of appearance to these parts exteriorly, especially in the human, they are thick and fleshy, but not so large or extensive as some others we shall presently describe, and are all attached to the patella, which affords them a better name. The *anterior* takes its attachment to the anterior edge of the posterior ramus of the ilium; on its sides it is attached to the patellaris internus and externus, and terminating inferiorly upon the patella, where it unites with the other two, forming a strong arched tendon, keeping the patella firmly in its place.

P. Subterior or Subinterior.—This lies underneath the former, inseparably connected with it, rising from the neck of the femur, is terminating with the preceding, and is more inseparably connected with the patellares than is the anterior.

Use, as the former, to extend or carry forwards the whole leg, by means of the patella. In man longer and thinner.

Dog.—There is, as Douglas has observed, a fifth extensor of the leg, which I have mentioned under the name of the *Fascia lata superior*, which, perhaps, should come more properly in this place. It extends from the spine of the ilium, adheres to the Sartorius by a fascia, and terminates in the patella, see large section of the horse, No. 85.

Felis the same.

Ox, ditto, *le triceps tibial*, Vitet, p. 191.

Patellaris internus.—This muscle takes attachment to the neck of the femur, where we observe tendinous asperities, passing down the inside of the thigh it terminates with the former, filling up the space formed by the inner trocanter.

In man longer, and in other animals, otherwise much the same. These four muscles might be called the quadriceps in all these animals, and the term vaste should be carried to the large sucro tibial muscles which from their extent and size are really so. (See large section, No. 86.)

Adductor planus tibiæ.—This is a very broad nearly square muscle, and very flat, whence its distinctive name. It covers nearly all the muscles on the inside of the thigh with its aponeurosis and fleshy fibres. It takes its rise from the whole length of the symphysis pubis, and passes with a flat even surface to join the tendon which envelopes the inner head of the tibia. It is the most general superficial muscle seen on the inside of the thigh. (See large section of the horse, fig. 88, a good view of it.)

Use.—Its direct single action is to draw the thigh and leg inwards towards the pelvis.

Ox.—It sends off a strong aponeurosis, which, joining with the aponeurosis of three other muscles, viz. the ischio tibialis externus, posticus, and gastroenemius, envelopes the tendo *Achilles*, and terminates with a very strong tendon in the os calcis internally of the other tendons on the inner notch, so that these all meet together, and may be called muscles of the os calcis; and this confirms the idea of these all being congener muscles, which seems to have escaped observation.

Acting singly to draw the legs inwards together, giving that awkward, wabbling, round-about motion, which the cow in galloping is seen to have, a feminine sort of effect and weakness, or may it not be that the abductors are acting more strongly, and this muscle drawing the limb back again, which movement of abduction may save in these animals the large full udder from being disagreeably compressed between the two legs.

Dog much the same; cat ditto. Its aponeurosis is attached, however, to the whole line of the internal edge of the tibia, it envelopes also the tendo Achilles.

Man.—It is a very small long thin muscle, from which it has been called the *gracilis.*—*Lafosse, Cours d'hippiatrique*, p. 119. *Le large adducteur*, Dict. 3, p. 5. *Vitet le Crural interne*, p. 188. *Stubbs' Anat. Horse*, tab. 2. *Gracilis.*

Adductor longus.—This muscle takes its rise from the posterior ramus of the ilium, extending over the muscles on the inside of the thigh, forming a thin body of muscle, it terminates by tendon to the internal head of the tibia.

Use is to draw the thigh and leg inward.

Compared with *man*, it differs in no particular respect; the artery, veins, and nerves, pass immediately underneath it as in man.

Ox.—It has two origins, one from the *iliacus internus* muscle, and the other from the margin of the pelvis where the *psoas parv.* terminates; its fibres admit the vessels and nerves to pass through.

Dog.—Its attachment is to the external angle of the ilium, not to the brim of the pelvis, as in the horse.

Cat.—Rises inseparably connected with the *fascia lata superior* one third of its length, terminating as in the others.—*Lafosse Cours d'hippiatrique; Le grêle adducteur, Dict.* p. 5; *Bourgelat le Couturier muscle adducteur; Vitet Med. Vet. L'ileo tibial; Stubbs Sartorius et omnium auctorum hum. anat.*

Poplitalis.—This is rather a singular insulated muscle, distinct and placed under the others on the back of the tibia; it is thick, short, and fleshy, taking rise on the internal edge of the tibia, passing obliquely upward, its tendon terminates in the external condyles of the thigh. Its tendon running from below upward, makes it appear like a muscle inverted: indeed it seems rather to belong to the thigh than the leg, because in that its tendon is inserted.

Use is to twist internally the tibia on the thigh, and its internal condyles externally.

Man, and in all other animals I have examined, it is present, and with the same characters.

Ox, the same. It is well seen in the large section, fig. 93. —*Vitet Le Poplité, p.* 191, *et omnium auctorum.*

Sacro-tibialis externus. This immense muscle lies posteriorly to the glutæi taking its origin to the third, fourth, and fifth,

spinous processes, or apophyses, of the *os sacrum*, becoming fleshy, it passes down and takes attachment to the processus triquetrus of the os ischium. Then dividing into three portions in the horse, or sometimes only two, the superior being inserted into the patella, and passing over it, it forms a broadish aponeurosis which covers the muscles of the leg, and afterwards terminates on the anterior crista of the tibia. Its third portion embraces the muscles of the cannon or shank. This third portion might form a separate muscle; but as we find it only one in the dog, we think it better not to make it distinct, that one name may apply to as many animals as possible. Stubbs makes it a separate muscle.

Use.—Draws the tibia and femur outward, its power being increased by passing over the patella.

Man.—No such muscle. The biceps might be considered its nearest relative, terminating on the outside of the thigh, as this does; but it is only attached to the ischium by one origin, and to the back part of the femur for its other, and is a very simple muscle compared with it. In the horse it is divided into three portions, in the ass into two only, and in the dog and cat the same.

Ox.—It is not divided distinctly into portions, otherwise like the horse, but is more fleshy. Its posterior portion sends off a very strong tendon to the tendo Achilles, which unites with that of the *posterior* and *planus* muscles, and is inserted into the lower notch of the os calcis, or its tubercle. Its rise from the ischium Vitet has not observed, in which it is similar to the horse. It must especially contribute to the rump of beef.

Cat, as in the dog. Lafosse, Cours, p. 120, *le long, le moyen, et le court abducteur*, Vitet, 287; *Le Sacro tibial;* Bourgelat, *le long vaste;* Stubbs, *Biceps cruris;* Douglas, p. 171.

Dog.—It cannot well be divided, and is attached, as in the human, simply to the tuberosity of the ischium, as are the two following muscles; whereas in the horse, &c. they are attached to the sacrum.

Sacro-tibialis posticus.—This muscle forms the posterior profile line of the buttock. It takes attachment to the sacrum behind the preceding muscle under the muscles of the tail, forming a cylindric body, it passes over the ischium, leaving a depression, called the poor line, between it and the exterior sacro tibialis muscle, which we see so strikingly represented by the painters. It is then joined by a round branch of muscle coming from the under side of the ischium. (v. great sect. 91.) These unite and form a single muscle which passes down to the back part of the leg, forming an aponeurosis and enveloping all the muscles of the leg, viz. the gastrocnemius and perforatus, and terminates on the inside of the tibia. Its tendon runs down and binds together the tendons of the gastroenemius.

Use.—This muscle is a true flexor evidently to bend the leg, and its aponeurosis to bind and unite the muscles of every class in one common action of flexion.

Man.—There is no muscle can compare with it: the semitendinosus is the one most allied to it.

Ox.—Rises wholly from the ischium, its external tuberosity terminating on the anterior part of the tibia, and sends off a tendon to the outside of the os calcis. Its form is much like the horse's muscle.

Dog.—The same, very large and strong.

Cat.—Precisely as in the dog.

Bourgelat, Le Biceps. Stubbs, Vitet. p. 191. *L'Ischio-tibial posterieur et Biceps tibial. Cours d'Hippiatrique, p.* 120, *le long adducteur. Semitendinosus*, great section, *fig.* 91.

Sacro-tibialis internus.—This, like the two preceding, arises by two heads, one from the point of the sacrum, the other from the point of the ischium, thence it takes a pretty strong attachment to the symphysis of the pubis, going internally, it then passes down the inside of the muscles of the thigh to terminate on the internal superior part of the tibia.

Use.—Singly, to bend the leg and thigh backward and inward.

Man.—There is no muscle much like it; whether it be most like the *semitendinosus* or the long head of the *triceps* it is difficult to determine; and we may see how ridiculous it is to try to make those things agree that never can agree, and about which a perpetual difference of opinion will arise; and if we call them by the human names, we shall only mislead and bring on ultimate confusion.

Ox.—It does not adhere to the sacrum, and like as in the dog it may be divided into two muscles.

Cat.—As in the dog.

Lafosse, Cours d'Hipp. p. 119; *le gros adducteur de la jambe*, Dict. p. 6.

Bourgelat, Le demimembraneux! St. Bel, semimembranosus!

Vitet, Med. Vet. p. 182. *Le portion posterieure du Triceps. Le biceps crural*, 186.

Douglas is silent on this head entirely.

Stubbs, Anat. Horse. *Adductor magnus femoris.* So that we have an equal division of opinion among these writers, whether it be the representative of the head of the triceps, or the semimembranosus, of Stubbs, what muscle is it? Short head of the posticus? Semimembranosus.

These three immense muscles evidently co-operate to one effect, and are better denoted and understood by considering them in this way, and by the above names than by the human names, even supposing their corresponding muscles in the human body could be clearly ascertained, as those names would only serve to convey the confused and erroneous idea of a detached office to each of those muscles, and as though they were in no way connected; it was the consideration of the three muscles last mentioned that first gave us the idea of the real effect of abductor and adductor muscles, in promoting animal locomotion. That such vast masses of muscle as these should be carried about by the animal to perform such trivial offices as abduction or adduction, it would be highly absurd to imagine; for it may be laid down as an axiom that the bulk of the muscle always bears some proportion to the importance of its office, and pursuing this reasoning a step farther, we may conclude that even abduction and adduction itself are often performed by the cooperation of what are termed extensor and flexor muscles.

Muscles of the tarsus and shank are four.

Tibialis anticus, or magnus.—This muscle fills the extensive hollow on the outside of the bone of the tibia, the *extensor pedis* lying before it, therefore, perhaps *anticus* should be exchanged for *magnus*, or some other designation for this muscle. It is attached to the superior external parts of the tibia, and passing down its lateral external hollow side, diminishing near its inferior part, and becoming tendinous, is inserted into the triangularis bone, and upper part of the cannon or shank; sending off a lateral tendon which is inserted into the superior part of the internal styloid bone, its tendon is strongly confined with that of the extensor of the foot by a transverse ligament which is not in the fore foot.

Use.—Obviously to bend the metatarsus on the tibia.

Man.—Placed outwardly of the extensor of the foot.

Ox.—It is attached to the external condyles of the thigh with the extensor longus.

Dog.—As in the human; that is, this present muscle is situated before the extensor of the foot, and has only one termination by tendon to the internal metatarsal styloid bone, *felis*, the same.

Lafosse, Cours d'Hipp. p. 121. *Le muscle du cannon.* Dict. p. 174.

Vitet. Med. Vet. p. 193. *Le jambier anterieur.*

Stubbs, Tibialis anticus!

Douglas, p. 177.

Tibialis internus.—This muscle I should rather consider as part of the anticus. In the ox, however, it is very distinct, lying close to the bone. It is very flat, going from the external to the internal side, and passing through the annular ligament in a sheath formed by the tendon of the tibialis anticus, it terminates by aponeurosis on the inside of the tarsal and metatarsal bones. Vitet, p. 195. *Lafosse, Cours d'Hipp.* p. 120. *Le flechisseur du jarret.* Dict. 24. Vitet, rien la dessus.

Gastrocnemius.—The extensors of the hind leg are placed behind and the flexors before, exactly reversed to the fore leg.

If placed the same in both legs, the animal would fall forwards or backwards as it might be, making the calf of the leg in man. It takes rise in the hollow we observe in the inferior external part of the thigh along with the perforatus, a little above the condyles, inclosing the perforatus between them. About half way down the back of the tibia they unite and form one strong tendon, which is inserted into the notch observable in the posterior superior part of the os calcis, and is kept down by the tendon of the perforatus passing over it, having previously formed an union with the tendon of the posterior tibialis muscle which wraps it round and incloses it all the way to its insertion. There is also a very strong tendon from the patellaris externus passes down with them to be inserted into the os calcis.

Use.—To act on the thigh, cannon, and foot, but apparently not the tibia, as not being attached to it; and the same in others, where a whole bone is interposed between the origin and insertion of a muscle. The insertion of these muscles is at such an angle from the leg, that they must act most powerfully in bringing the shank and tersus forward to a straight line with the leg after it has suffered flexion, and the greater the distance the more the power.

Man.—Much the same.

Ox.—There is a very strong tendon to the middle division of the gastroenemius, which may be saparated, and is no doubt the representative of the tendon of the human *soleus*, but the fleshy body is not to be divided from the gastroenemius.

Dog.—Felis the same, but possesses, which the dog does not, a very large muscle, the *linearis*, but which has not the characters of the human soleus. It rises on the posterior part of the head of the fibula and passes underneath the gastrocnemius and perforatus, and terminates by distinct tendon on the os calcis, and appears to be a very distinct muscle, is it not like the *linearis* enlarged, or is it the soleus representative?

Lafosse, Cours d'Hipp. p. 120, *les jumeaux*. *Vitet*, les jumaux. Bourgelat, *Extenseur du canon*.

Stubbs, *Gemellus*. Douglas, *Extensor tarsi suralis*. Extensor magnus, p. 173.

Linearis.—This small muscle had escaped my observation a long time; it rises from the outside of the tibia, near the fibula, passing obliquely backward, it joins the tendo Achilles, and is with it inserted into the top of the os calcis.

Use.—To turn the tarsus and cannon inwards.

Man.—It agrees in many respects with the human *plantaris*, still that is attached to the external condyle of the os femoris.

Felis do not perceive it.

Ox.—Vitet states its existence, but I do not find it; there is a muscle, however, attached to the tendon of the flexor longus.

Lafosse, *Cours d'Hipp.* p. 120. *Le Grêle extenseur. Dictionaire*, p. 25.

Stubbs has not noticed it. The perforatus he calls the plantaris!

Douglass says the true human *plantaris* exists in the dog, p. 175.

Extensor brevis pedis.—This is a small muscle which takes its rise on the tarsus, so small that it might easily escape notice. In the horse it passes over to the anterior part of the shank, passing down the inside of the tendon of the extensor longus, and reaching the pastern it there divides into a broad aponeurosis passing underneath the extensor of the foot, covering over the whole anterior surface of the head of the pastern, it frequently joins to the extensor longus of the foot without reaching the pastern. I have seen it go to the pastern in one leg, and terminate in the tendon of the extensor longus in the other leg.

Use.—To extend the foot in combination with other muscles.

Man.—A more considerable muscle.

Dog.—Much as in the human.

Ox.—More distinct than in the horse, terminating in the tendon of the extensor longus.

Felis as the *Dog*.

Lafosse, Cours d'Hipp. p. 122 Dic. p. 438. He makes three flexor muscles one, viz. of the suspensor ligament, and two others belonging to the styloid bones.

Vitet, n'en dit rien.

Stubbs, Flexor brevis digitorum pedis.

Douglass describes it in the dog, p. 184, and tells us the dog has two muscles of this sort.

Extensor longus pedis.—This muscle lies the most anterior of the muscles on the fore part of the leg, its body being lodged in the same channel with the tibialis, on the outside of the tibia; it begins at the external condyle of the femur by a strong tendon, it passes down the anterior of the shank, pastern, and coronet bones, and terminates on the anterior recurved summit of the coffin bone; it is also strongly attached to the pastern and coronet bones.

Use.—Obviously to extend the three bones which compose the foot phalanx, although the extension of the foot in standing is chiefly performed by the weight of the body.

Man.—It is something similar to the human extensor pedis or digitorum com. but that rises from the tibia.

Ox.—Has three muscles, all rising from a single tendon on the external condyle of the femur, the tibialis anticus and two extensors; one lies on one side, and the other rather behind the tibialis anticus. They are small, making together the same size as that of the horse; degenerating into tendons, they pass through the annular ligament, and passing the tarsus and metatarsus, are joined by the extensor brevis; it then divides into two, lodging in the channel of the bone, and the other tendon again divides into two thin, round tendons, which passing down the inside of the pastern, coronet, and foot, terminate on the prominent or curved point of the two claws. The other, or internal tendon, terminates by aponeur. covering all the anterior of the pastern and coronet, and terminating on the edge of the foot bone. *Vitet*, p. 197. *L'extenseur externe.* He says, though wrongly, that they terminate on the second phalanx.

Dog.—It lies behind the tibialis anticus, taking rise on the head of the tibia, passing with the tibialis anticus through a restraining ligament, it splits into four tendons, one going to each extreme phalanx of the toes.

Cat.—The same, except that it is confined at the tarsus by a singular floating loose loop of ligament.

Lafosse, Cours d'Hipp p. 122. *Dict.* p. 37. *L'extenseur antérieur. Bourgelat*, ditto.

Stubbs, Extensor longus digitorum pedis.

Peroneus longus.—This small muscle is situated on the outside of the leg, taking rise on the head of the fibula, passing down the outside of the tibia and tarsus, where it is confined by a ligament, passing forward to the front of the shank, it then joins the extensor longus of the foot. Vitet observes: It sometimes terminates on the pastern, p. 193. L'Extenseur du paturon. *Stubbs*, Peroneus anticus. Bourgelat, *L'extenseur lateral.*

Use.—To act on the extensor longus as an auxiliary, directing it a little outward.

Man.—There are three tendons, of which this performs the united office. Vitet, L'extenseur externe, p. 197.

Ox.—The tendon of this muscle does not join the extensor longus as in the horse, but expanding and passing down the anterior part of the pastern and coronet, terminates on the last phalanx, performing the same office, being like the internal division of the tendon of the extensor longus, passing through two annular bands in the cow, and but one in the horse, near the tarsus. It is improperly called *peroneus* here, as there is no proper fibula to this animal.

It has also another, the *pero-metatarsalis*, from the external condyle of the tibia, anterior to the longus, passing through the annular ligament with the longus, it terminates by an extended tendon on the outside of the metatarsus. Vitet, p. 196.

Dog.—The same, but connected with a *fibula.*

Cat.—The same, goes fleshy half way down.

Perforatus.—This muscle is seen on removing the gastrocnemius; it rises from the same place, the *fossa perforigera*, or deep excavation in the femur a little above the external condyle. About half way down the back of the leg it becomes tendinous, and passing over the gastrocnemius tendon, it

takes a strong adherence to the os calcis, wrapping round and inclosing the tendo Achilles with its expansion; becoming again cylindrical, it passes down the posterior part of the shank and through an annular ligament behind the *ossa sesamoidea*, where it forms a ligament anteriorly for the tendon of the perforans to pass through; at length it terminates upon the inferior part of the pastern, and to the sides of the coronet bone.

Use.—To bend the phalanx of the three foot bones, or rather the pastern and coronet, the foot being fixed on the ground.

Man.—The perforatus rises from the os calcis; in other respects it agrees with our animal, except in its divisions to every toe. This muscle, like several others in this more simple animal, unites the power, and uses, and situations of several muscles. In this we may detect the soleus in taking its attachment near to the condyles of the femur, and the os calcis, and from this bone it much resembles the human perforatus.

It may be considered as the principal muscle which keeps all the animals which walk on the last phalanx of the toes from touching the ground with their fetlocks. For in the human anatomy we find the soleus muscle, a muscle of the same nature and attachments as our perforatus, but which is terminating on the extreme end of the os calcis; and there is another muscle totally distinct from this, and which rises from the os calcis, and which is perforated by the tendons of the perforans, and which resembles the lower part of our perforatus from the os calcis downwards.

Now, in the horse it appears that these two muscles are joined in one which is extending from the back of the tibia to the toes, resting in its course against the os calcis as against a lever of considerable length, and this lever yielding to the pressure of the horse when in action, must cause an easy springing motion of all the lower parts of the limb, regulated elastically by the degree of tension of the fibres of these muscles, and the very great extent of their tendons and moveable bones attached to them; so that this double muscle, or double attachment, rather gives the properties of both soleus and perforatus to this muscle. In the broken-down horse, therefore, this is perhaps the muscle most injured. The number of divisions in its tendon is known by the number of toes or claws, one in every animal being sent to each of them.

The hollow cylindrical sheaths, or canals, formed by our perforatus are widely different to the mere fissures or slits formed in the human, being vastly stronger, more compacted, and embracing. These slits permit the final tendons of the perforans to pass through them, one to every claw or finger, as we have said.

Ox.—Like the horse, but divided into two tendons, one going to each coronet. *Vitet*, p. 198, *le perforé.*

Dog.—Divided into four tendons. Douglass, p. 132, says five.

Cat.—This muscle rises from the two sesamoid-figured bones belonging to the condyles of the femur, passing under the gastrocnemius and over the os calcis, it becomes fleshy, and then divides into four tendons, going to each toe.

Lafosse, Cours d'Hipp. p. 122. *Dict.* p. 409. *Flechisseur de couronne. Bourgelat, le sublime. Vitet*, p. 194. *Le perforé. Stubbs*, Anat. Horse, *Plantaris. Douglass*, p. 184.

Perforans.—This muscle rises on the back head of the tibia, close behind the fibula and partly to the external condyle of the tibia, passing down the back of the tibia in taking adhesion to it forms a strong tendon which passes over a sinuosity in the os calcis on its inside, next passing under an annular ligament down the back of the shank and through the channel ring or annulus formed by the perforatus, down the back of the pastern, coronet, and nuciform bone, it then expands and forms a strong adhesion to the *retrossa*, and whole inferior surface of the coffin bone, and is then covered by the furch.

Use.—Flexors of the last phalanx of the foot. There appears a little incongruity in calling these muscles flexors which bend the foot backwards, since in the bone above, viz. the femur, we call those flexors which carry it forwards, and extensors that straighten it and bring it backwards or in the opposite direction. Now, in the fore foot no such difficulty occurs, since the humerus in its flexion is taking the opposite direction to the femur, viz. backwards. We are compelled, however, to make these same muscles in the two limbs to accord by using the same terms to them, as their functions and directions are the same in all respects. We believe, however, other and better terms than those of *flexion* and *extension* might be resorted to, for to express the actions and performance of the upper muscles of the limbs, and with great advantage, as affording more clearness as to their real functions and effects. Perhaps *gonufacients* and *rectofacients*, or the *impellers;* and those below *grimpers* or *protensors* and their sustainers. For in the act of going forwards the body is acted upon in two different ways; the upper bones and muscles advance or throw the whole limb forwards, whilst the lower bones and muscles are extending and fixing it on the ground, then the upper muscles again acting or continuing their action, obliterates the angle so formed, and the body thus becomes advanced.

Use.—With the perforatus to restrain the too much extension forwards of these podal bones.

Man.—These muscles and the tibialis posticus both possess characters of the *flexor longus pollicis pedis*, but this muscle, when about the middle of the sole of the foot, divides into four tendons.

Ox.—This muscle arises by two heads from the back internal head of the tibia, the external portion unites with the middle portion before it reaches the grooves of the os calcis. This middle portion is the most considerable, and forming a tendon it passes along the back side of the os calcis and down the shank (being there joined by the tibialis posticus), it divides near its bottom into two tendons, sending one to each claw after passing through the annular of the perforatus.

Vitet, 199. *Le perforant.*

Dog.—It divides into five, one going to the great toe, which in these animals is the least. Douglass, 188. The dog has little thin strings of tendons which he considers as representing the *lumbricales.*

Cat.—Differs in hardly any respect from the dog. It serves, however, these final tendons, to draw the claw out of its sheath, and at the same time bring it at right angles with the metatarsus, and holding it firm in this situation empowers it to rend or scratch forcibly, and on the muscle relaxing it is drawn partly back again by the extensor longus and partly by the leg, coming to a right line with the foot, when being relaxed it loses all power of holding.

It has been conceived that there was a muscle on purpose for this effect, but there appears no other, in this animal at least, than the perforans; and the claws of the dog are much the same, but without so much sheath. In the *lion* there is an excavation in the last bone of the toe to admit the claw; in the cat the claw is fixed in the bone immoveably, a ligament is placed on one side, running round the enlarged end of the second phalanx as round a pully block, and is then inserted into the last phalanx. The perforans in all these animals is passing through a cartilaginous cylinder, or canal, or sheath, formed for it by the perforatus. Now, in the human the perforatus is simply slit to permit these tendons to pass through.

Lafosse, Cours d'Hipp. 122. *Le gros fléchisseur.* Dict. 438. Vitet, 195. *Le perforant.* Bourgelat, *Le profond. Stubbs*, Flexor longus digitorum pedis! Douglass, p. 186.

Perforans minor.—It is rather a small muscle which has its beginning on the external condyle of the tibia, passing down its back part to the inside of the perforans, crossing over the inside of the tarsal bones, in its proper groove and down the back of the shank, it there joins the tendon of the perforans.

Use.—To assist the perforans, and incline the lower parts of the limb outward.

Man.—Whether it best represents the *tibialis posticus* or the *flexor longus pollicis pedis*, is difficult to assign.

Dog.—Much the same.

Cat.—Ditto. There is, however, another muscle superadded, which rises on the tibia, immediately behind the politæus, and is terminating on the root of the metatarsal bone of the great toe, or at least internal toe.

Ox.—This muscle forms the internal portion of the muscle

which in that animal is representing the triceps, so in the horse this and the perforans may be considered as a biceps single muscle. It passes the same through bands differing in no respect from that of the horse.

Lafosse, Cours d'Hipp. p. 122. Le grêle flechisseur.

Stubbs, Anat. Horse, tibialis posticus. Douglass myol. comp. p. 178.

LIGAMENTUM METATARSI INTEROSSEUM.

This notable ligament, which has been made a muscle of by some writers, and is really so in the digitated animals, and is called there the *interossei*. It lies between the two styloid bones, and takes its rise on the second layer of bones of the tarsus at its posterior part, passing down the back of the shank; when near the fetlock it bifurcates, a branch going to each side of this strong joint, and next surrounding the sesamoides, it terminates on the anterior inferior part of the pastern bone, and there is joining the extensor of the foot. Its upper part is somewhat muscular, which by yielding at times may save it from rupture under strong impression, the power of the fetlock joint depending much upon it. Underneath it lies the artery.

Use.—To resist the too great extension of the angle of the fetlock by the weight and actions of the body, urged by the foot and juxta-podal bones being in certain cases exerted with surprising force. This ligament perhaps gives way also with the perforatus tendon when the horse fully breaks down, as in racing, &c. It is much strengthened by going to the anterior part of the foot.

Man.—It no doubt chiefly corresponds to the *interossei* muscles, but here the joint requiring strength rather than motion or action, a ligament is made of it to supply the place of a muscle, or series of muscles.

Dog.—Differs essentially from both human and horse; from the human in the interossei muscles not being placed between but underneath or behind the bones of the metatarsus, and from the horse in being very muscular, uniting perhaps the *lumbricales* and *interossei*, having the shape of the *interossei*, and situation and action of the *lumbricales;* but there appears something like *lumbricales* also in these animals.

Now these muscles seem to keep the animal erect on the phalanges of the toes, not suffering the tarsus to come to the ground, elastically springing and afterwards assisting in enforcing their rebound from the sod, and at times in burrowing, scraping, and removing the ground, but ligamentous in the horse, who has little or no want of this sort; they are therefore *musculi raptorii* as well as *suspensorii* in these smaller creatures. In the horse being ligamentous there is a saving of muscular action and of sensorial expenditure, from three sets of muscles as they are in man.

Lafosse, *Cours d'Hipp.* p. 121. Les grêles flechisseurs. Dict. 377. Le gros flechisseur du paturon.

Vitet, *Le grand ligament posterieur du canon*, p. 106.

Stubbs, *Interosseus.* Douglass, *Interossei*, p. 137.

Ox.—This ligament divides into four parts, surrounding four small friction bones or sesamoids, to ease the two articulating surfaces of the two pasterns. There is more appearance of muscularity in this ligament in this animal chiefly near its upper part.

Cat.—Same as dog.

Obs.—The *ligamentum plantare* of the human foot agrees much with this ligament in its use, but it is situated above the muscles or over them; whereas in the horse it is next the bone, the tendons passing over it. The interossei act in the human in drawing closer or separating the toes, not at all wanting in the horse; therefore converted to a ligament as we see it.

The dog has a strong rank smell during dissection, after a few days especially; and the cat still more faint and disagreeable.

Remarks on some peculiarities in the Viscera of the Horse.

Of the lungs of the horse.—This viscus in the horse consists of three lobes, two large ones which occupy the sides of the chest, having at their anterior presentation two elongated auriform appendages which closely envelope the heart; the third or central lobe is much smaller, lying between the other two, and presents itself to the sternum. It is not unfrequent in the lungs of horses that small red patches are observable that will not inflate like the other parts of the lungs, and are therefore, not improbably, obliterated cells from colds, inflammation, &c.; the settling of the blood will also give an appearance of this kind, but this does not prevent the lungs from inflating.

The trachea of the horse, where it passes into the chest, and previous to its entering the lungs, has a singular duplicature of the cartilaginous rings, which is more flexile than the rest of this tube, so as to admit, by very slight pressure, of the sides of the tube being brought in contact, and the total obliteration of its cavity: this structure may perhaps adapt the diameter of the trachea to any quantity of air that is passing through it to the lungs.

Of the liver.—This viscus in the horse is large, deeply cleft into lobes, and possessing no gall-bladder. The ductus venosus of the human fœtal circulation is also wanting in the equine fœtus.

Of the stomach.—The stomach of the horse consists of a pouch or bag of the usual obcordate or reniform figure without; within, it is lined with membranes, which more resemble the coats of the different stomachs of ruminating animals than the inside of the generality of stomachs of this external figure. See pl. 4, fig. 1.

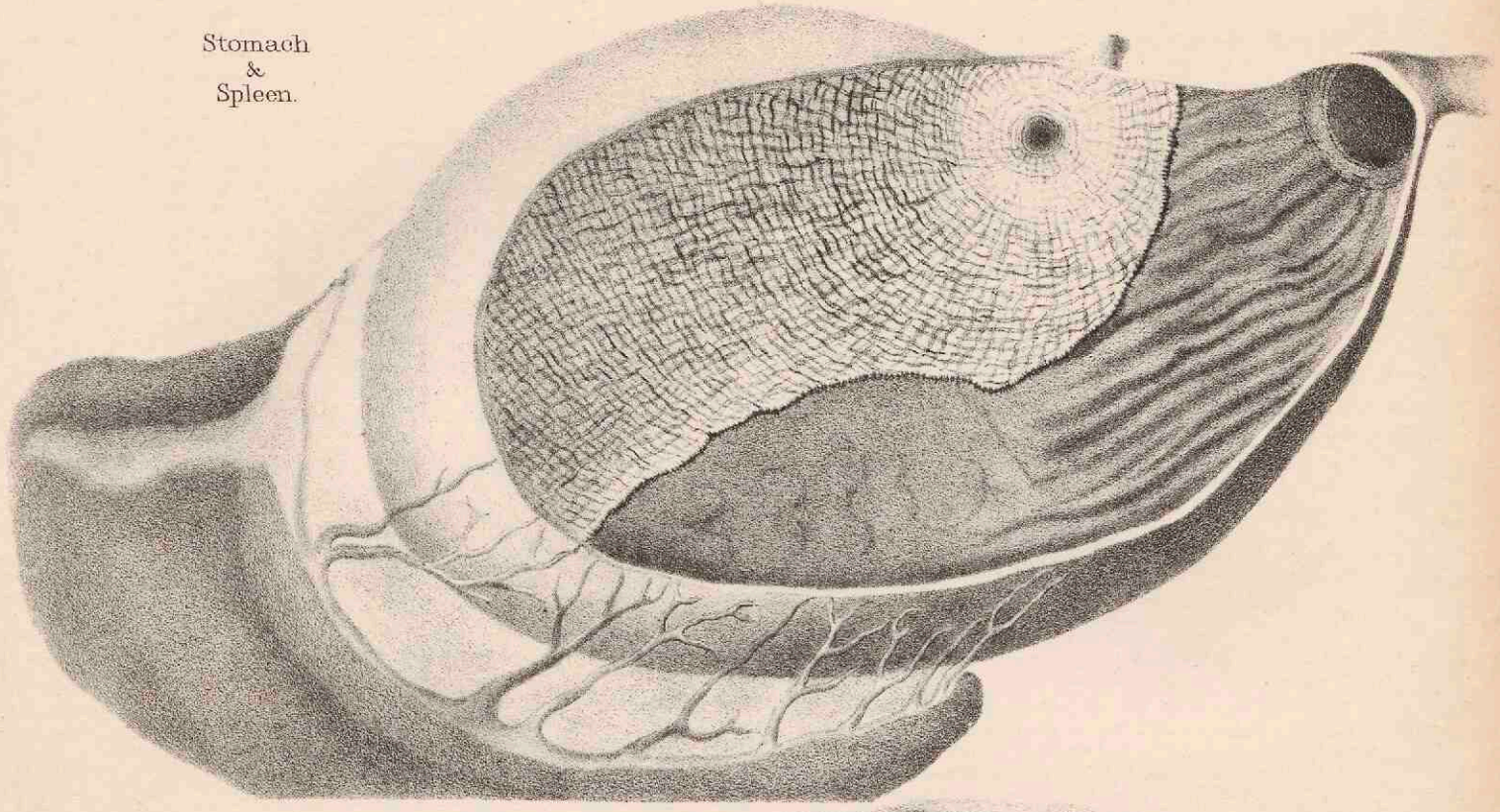
There is distinguishable on the inside a white rugose chequered coat, which is not very vascular, being a continuation of the elastic insensible white tissue, which lines the œsophagus; this spreads over the upper part and broad end of the stomach, till it abruptly terminates about its middle; this part of the stomach corresponds very much to the paunch, or first stomach of ruminating animals.

The second division, occupying the lower part or great arch of the stomach, extending high up the sides towards the small arch, and reaching nearly to the cardiac orifice, is lined with a smooth red membrane, and is highly vascular, resembling more the stomach of carnivorous quadrupeds; the rest of the stomach, extending from the termination of the former to the entrance into the duodenum, consists of a pale red membrane, extremely loose, and thrown into longitudinal folds or duplicatures, intermixing with the former coat by almost imperceptible gradations of colour; this coat is thickly covered with a slimy mucus, not observable on the other coats; this part of the stomach has a strong resemblance to the fourth, or last stomach of ruminating quadrupeds.

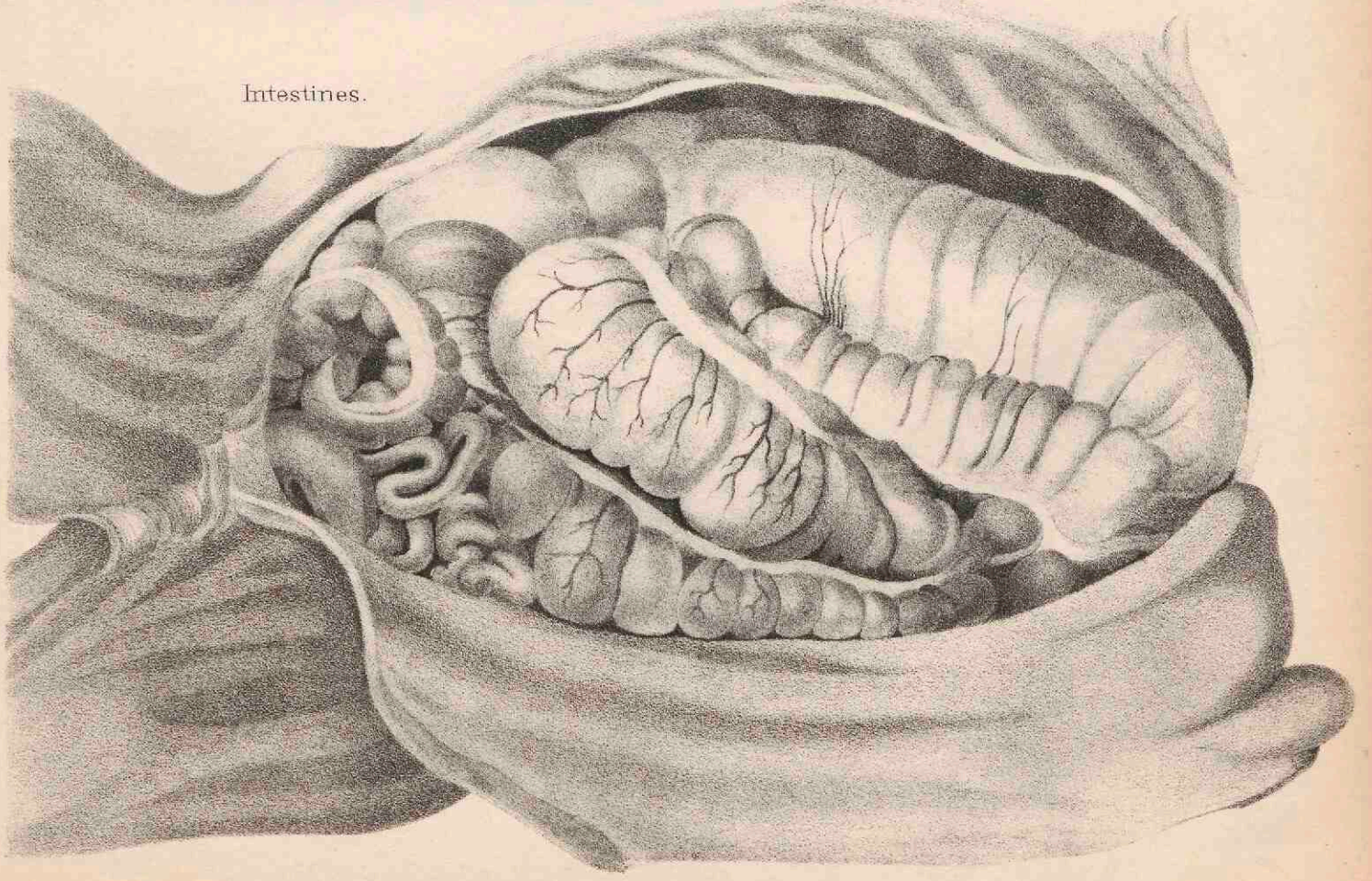
The exact purpose of these three constructions of membrane in the same stomach is not easily assigned; whether they all unite in one common purpose, as though the stomach consisted of one common membrane for its lining, or whether the food is changed by the successive operation of each of these membranes, we know not: we may observe on opening the stomach that the food makes pretty much the same appearance against whatever part of the stomach it may lie, that one should be hardly led to conclude they have in the horse distinct functions, but combine in one common effect, and are in reality the rudiments only of the structure of the stomach, peculiar to the generality of graminivorous quadrupeds, without producing any precise effect here; for it seems difficult to imagine how the different operations should take place in the same sac without disturbing each other. Nature seems to observe a connected system, not only in the entire animal but also in each particular organ, forming a catenated system of structure and operations.

It is generally imagined there is some valvular apparatus to this viscus, which prevents the horse from vomiting, and

Stomach
&
Spleen.



Intestines.



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much has been written on this subject. We never could discover anything of the kind, and are disposed at present to believe, that as the form of the horse would render vomiting inconvenient, the power of receiving the impression which excites to this operation is withdrawn from the animal, as it would be idle to suppose a power given to vomit with a structure of parts not admitting of it; it would be as inconsistent as placing the head of the lion on the shoulders of the hare, or giving the disposition of the hare to the lion's form, by which the very purposes of nature would be defeated. It was, however, an opinion entertained with some confidence, at the veterinary college of Copenhagen, that the root of the white hellebore (veratrum album) would occasion a horse to vomit, being placed under the skin!

In an ass's stomach I have seen a valvular apparatus at the cardiac orifice, and the insensible white membrane extended into the inside of the stomach, about one inch, forming a loose fold, which served to mark the divisions of the stomach more strongly, but could not in the smallest degree operate as a valve; this lusus is, however, not very frequent. The stomach of the hog also partakes in degree of this sort of structure, though not so distinctly marked as in the horse.

The spleen also is here seen attached to the stomach, whose use is not yet well made out; it probably serves the office of warming-pan to this viscus in aiding and facilitating the digestive process by its close embrace, as also by the large vessels passing from it to its large curvature. Its numerous absorbents and cells may also assist in regulating the consistence of its contents from being too fluid or too solid for easy digestion, as either of these conditions would much impede the course of it.

Intestines.—A pretty good view of the intestines of the horse is seen fig. 2. The *colon*, *cæcum*, *ilium*, and *rectum*, with their ligamentous constricting band forming them into *sacculi* or pouches.

Of the chyle duct of the horse.—This duct in the horse is not very difficult to find, both from its magnitude and situation, lying on the aorta at the loins very much exposed, as it passes forward towards the thorax it dips lower beneath the surface, passing nearly under the aorta; it is much smaller in the middle, and enlarging to each end; about the fourth, fifth, and sixth ribs, it is as large as a man's thumb, it becomes narrower again as it passes into the axilla, but enlarges again at its termination, where it enters the vena cava, or rather the vessel formed by the union of the two jugular veins, and anterior to the subclavian, it there forms a large round head or cyst, and is provided with a valvular apparatus to prevent the return of the chyle or the blood from entering the duct. Toward the loins it has a strong adherence to the coats of the aorta, and lower down is strongly embraced by the tendon of the diaphragm; it then enlarges, and passing upon and by the side of the lumbar veins, discharges itself by several openings into them, which openings are also provided with valves.

The openings of this duct into the lumbar veins, which we believe have never been before remarked, seem to point out a double circulation in this vessel, viz. from the middle to each end, as the smallness of it in the middle would also seem to indicate; we have, however, in some subjects found a valve opening anteriorly, or towards the jugular veins, within six inches of its anterior termination; this duct, however, is subject to very great variation.

In another subject we found this duct terminate about the second lumbar vertebra, where it divided one branch forming a sharp curvature, circumscribing a portion of the insertion of the diaphragm; the other seemed to be lost about the fourth or fifth lumbar vertebra in smaller ramifications. In another subject which we injected, the duct was discovered on the left side, about the situation of the last dorsal vertebra; it crossed the aorta and passed to the right side, immediately before and resting against the superior mesenteric artery; it then divided into several small canals which appeared to be passing to their termination in the lumbar veins.

Parts of generation.—No animal whatsoever is more richly provided with the various apparatus belonging to these parts than the horse, for nature here seems to have lavished with profusion whatever can tend to perfect the generative act; and there is no part of the human construction of these parts but is found in the horse; the most essential difference appears to us to consist in the male, of the penis being suspended from the integuments of the abdomen, and not immediately from the pubis, as in the human; hence the acuteness of the angle where it passes the pubis, is such as to render the passage of the catheter almost impracticable.

We have remarked that the penis of the horse possesses a voluntary power of erection, not known to the human, or perhaps most other animals; this power is exerted on making water; and though the erection is not very considerable, it is yet sufficient to bring the penis from its sheath, which is effected apparently by its increased gravity from blood accumulating in the cavernous cells of this part. After staleing this semi-erection of the penis subsides, and it again is retracted within the sheath: this operation, though occurring daily to the sight of every one, has not, it is apprehended, been noticed by any veterinary writer.

The urethra of the horse is muscular from one extremity to the other, being formed on the outside of strong transverse fleshy fibres, and supported by a strong ligament.

Naturalists were long at a loss to discover the *mammæ*, or teats of this animal; in the male they were at length detected by Buffon, on the sheath of the penis. Mr. John Hunter also made the same remark without knowing that Buffon had previously noticed it; these teats are largest in the fœtus and young foal, dwindling with age.

In the glans of the penis, immediately over the opening of the urethra externally, there is a large cell or cavity, smooth on the inside, and lined with a membrane, which secretes a brown unctuous substance for the lubrication of the penis, and defending it from the corrosive effects of the urine; another cell, of a similar description with the former, is observable on the side of the urethra, and nearly surrounding it; it is separated from the former by a membranous partition.

The apparently unctuous secretion above described, is miscible with water; it burns, however, in the fire like an oily substance, and is not soluble in spirits of wine or nitrous acid, nor does it dry on exposure to the air during several weeks.

There is nothing resembling a frænum to the penis of the horse.

The *cavernous body* of the penis has no longitudinal septum; its cells are divided by transverse fibres, which are probably muscular; it terminates in a point near the extremity of the glans, where it is surrounded on every side by the venous body, termed in the human, *corpus spongiosum*.

Another singularity in the genital parts of this animal is, that there is an immense congeries of veins, lying on the back of the penis, which are filled during copulation, forming an elevation nearly as large as the penis itself; these veins communicate with both the cavernous and spongious bodies.

The *vesiculæ seminales*, and the bladders attached to them, are very large in the horse, having integuments of considerable thickness.

There is a great peculiarity in the structure of the *vas deferens* of the horse, which, in passing over the bladder, enlarges to the size of the human thumb; this amplification extends from its entrance into the urethra, to the distance of five or six inches from this point, where it again becomes of its ordinary diameter.

The inside of this enlargement is composed of cells, and somewhat resembles in construction the cells of the *corpus cavernosum penis*, passing in a transverse direction across the tube. In the centre of this enlargement passes the small canal of the *vas deferens*; each cell communicates by one, two, or more small pores with the general canal of the vas deferens; these cells diminish as they approach the neck of the bladder, till they are lost in a smooth passage entering the urethra.

What the purpose of this structure is, does not appear; it

must retard the passage of the *semen*, and probably adds some fluid to it, secreted from the cells themselves.

On a first view of the *pudenda of the mare*, the position of the *Clitoris* appears to be inverted, compared with the position of the same part in the human, being found on the lower part of the vagina; this apparent difference is removed when both are considered in the same position.

In dissecting the horse's penis, about the year 1792, I found in a general way the glans was not fully injected from the injection of the spongeous or cavernous bodies of the penis, but required a distinct operation. I have lately observed, in seeing the act of copulation with the horse and mare, that the penis was erected without the glans becoming injected, and that in a very celebrated stallion (Camel), and that the penis entered the vagina with the glans uninflated, but on its coming forth it was inflated, and of considerable magnitude, to wit, the full rose, as it is called, and then appeared to be sufficiently large to fill the whole bottom or end of the vagina, when probably the end of the urethra, which is projected forward to some distance in the horse by a sort of nipple, would be found in contact with the *os tincæ*, so as to inject the semen perhaps into it most effectually, and leaving little doubt of the semen actually entering the cavity of the womb. This projection from the urethra in the horse is a little lower than the middle part of the glans, and perhaps the opening of the *os tincæ* also is so disposed, from whence the semen is taken up by the fallopian tube and carried to the oviary by a reverse action of it.

I mention this curious matter the more, because in a communication respecting the penis of the horse, read at Cambridge in 1833, before the British Association, by Mr. Earl, the surgeon, it was asserted the glans of the horse was not large, he probably not having succeeded in fully injecting it; for it is of all the generative organs of the quadruped world perhaps the most magnificent example.

I have supposed there was a convenience in its not filling at first, that the presentation of the penis, which is somewhat difficult and precarious in these animals unassisted, would have been increased had such enlargement been the case, and the possibility of error on the direction of the effort have been increased if of its largest dimensions. Nor am I sure such is invariably the case, as I think I have seen the glans more than once fully injected before copulation, and this perhaps where the act was not done with usual vigour. We know the back stroke of the penis in the vagina is particularly calculated for filling the glans by meeting the crest of the penis, and by its pressure against the pubis perfecting more efficiently the performance of the act. The glans also we have thought was longer in subsiding than the cavernous bodies.

The ass appears nearly, or quite destitute, of the corpus spongiosum of the penis.

The cumulated veins on the dorsum of the penis of the horse have perhaps their office in distending the vagina of the mare, and thereby shortening its length, bringing its fundus more fairly into contact with the extremity of the penis.

On the ossa spongiosa equina.—There has always appeared to me some perplexity respecting the construction and communication of the facial cavities of the horse. June 1st, 1807. In a newly-foaled filly, that died in the foaling, I found unexpectedly, and whether it be new or not I cannot tell, as these cavities always appeared to me closed and without communication with each other.

On making a transverse section of the head or face, near the lower edge or margin of the orbit of the eye, the saw was found to pass through the lower part of the frontal sinuses, or rather cavities in the horse, and through the upper part of the maxillary cavities; on inspection of which, there presents in such section, a lap or duplication of a partition which is partly closed and partly open. On following the open part and breaking away the side of the maxilla, this opening was found to lead over the *os spongiosum internum*, or *minus* the slit or opening was immediately over the high projecting summit or top of the third grinder reckoning from the front of the mouth; so that any fluid formed in this cavity and falling downwards would distribute itself over the surface of this bone, and would arrive at a kind of blind end in the nose, through which as it could not pass it must distribute itself on the surface of the cavity, or if the horse threw his head or nose high it would apparently be carried to the throat over the palate. The utility or necessity indeed of moisture for the propagation of both taste and smell is sufficiently understood. And the air drawn through the nostrils, if drawn through these cavities, would keep them in too dry a state; and therefore access is thus limited by an approach only in the opposite direction, and that not immediately. In this way these convolved crustaceous bones appear to receive in diminished but sufficient quantities the odorant particles, and only in larger quantities by a sonorous snort or snifting with the nose, their very extended surfaces in this way conveying an ample impression, of which travellers relate instances of their giving plain notice of the presence of rivers in arid countries at two miles distance. And it would appear that when the head is held perpendicularly these fluids would accumulate to some inches in depth, but when the head is at an angle of 45° these fluids must overflow into these slits at half this depth, being nearly on a level with the bottom of the cavities, such would readily empty their contents, and which passing over the turbinated bones would flow into the chamber before described.

On laying open the upper turbinated bone, another semi-osseous, very thin, flexible, and almost transparent, bone was found inside, with numerous vessels on its surface, partly filled with air and partly with a dark sanguineous fluid; these vessels had much the appearance of absorbents.

This smaller internal spongious bone terminated in a point at either end, the lower more like a fleshy tube, the upper more bony. This being laid open was found hollow, irregular, and transversely divided by two bony partitions. The lower about its middle nearly double, the upper surface of the inner bone appeared nearly devoid of any membranous covering; its inferior surface, however, exhibited a membrane. The lower extremity of it terminated in a tubular or convoluted chord, having strong muscular fibres going to the nostril, the upper end seemed to finish in a blind tube of bone having small perforations. There is considerable obscurity about these parts. Thus much is clear, that the opening outwards into the nostril is behind the transverse partitions, and not at their bottom.

The lower turbinated bone has two of these crustaceous bones within it, but considerably smaller than the above. The superior part of this cavity is not covered by membrane; on the front of it rises a process like a thin cup or acorn, a larger cell of a triangular figure lies behind this, and an elevated line of bone shows the duct or conduit for the nerves of the lips. From these cavities there appears a gradual percolation to moisten the parts leading to the external nostril.

For a splendid representation of the crustaceous bones, see Large Section of the Horse's Head, pl. 2; and for a section of these bones, see Frontispiece to the Bits, or pl. 1.