ridges of the cuboid groove. This is looked upon by Testut as a variety of the peroneus quinti digiti.

In a male subject the writer saw, on both sides, the peroneus longus divided into two portions; the outer and larger passed down in the usual course of the long muscle, but the inner and smaller portion, which arose principally from the intermuscular septum, ended in a tendon which passed through the same compartment in the annular liagment as the outer portion, and immediately before it reached the peroneal tubercle it divided into two parts, one of which spread out and was inserted into the tubercle; the other crossed over the tendon of the peroneus brevis and was lost in the fascia covering the dorsum of the foot; between these two tendons passed the tendon of the peroneus brevis. This was probably a variety of the peroneus quinti digiti and peroneus quartus muscles.

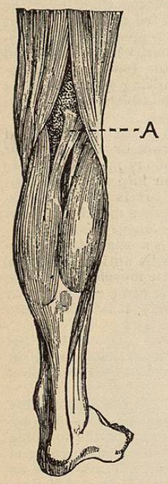

FIG. 3455.—*A*, Example of a third head to the gastrocnemius. (Wood.)

Extensor Brevis Digitorum. The number and arrangement of the tendons vary considerably. Very frequently one or more of the tendons are doubled. A slip not infrequently goes to the little toe. The number of tendons may be reduced to two; occasionally a single tendon may have two muscular heads in connection with it. The innermost portion going to the great toe is often separated from the rest of the muscles, and is called the *extensor brevis hallucis*. Wood describes cases in which slips from the tendons of the extensor brevis joined the dorsal interosseous. There may be a special slip going to the second metatarsal bone or long extensor tendon of the second toe. This would be the homologue of the extensor indicis of the hand.

Gastrocnemius. The two bellies are sometimes more or less completely separated from each other, as in the marmot, unau, coati, etc. The most common anomaly is the existence of a third head (see Fig. 3455). This consists of a band of muscular fibres, which may arise from either condyloid ridge, the popliteal surface of the femur, or the posterior ligament of the knee-joint; passing down, it most frequently joins on the united muscle. This third head may pass between the popliteal artery and vein, or over both vessels and nerves. It is sometimes divided into two portions.

The writer has seen a third head arising from the inner side of the tendon of the biceps femoris, about three inches above the condyles. It passed down, and joined the external head about one inch above its junction with the internal one. This is the normal arrangement in the lion and some other animals.

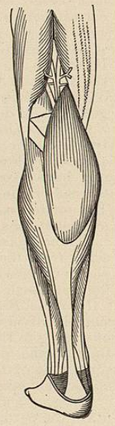

FIG. 3456.—Absence of the external head of gastrocnemius. (Shepherd.)

A slip may be given off from the biceps, semitendinosus, or adductor magnus to the gastrocnemius. The writer, in one female subject, saw complete absence of the external head. On removing the skin and fat, the first structure which came into view was the plantaris muscle (see Fig. 3456). Absence of the whole muscle has been observed.

Occasionally a sesamoid bone is developed in the tendon of the external head. A similar arrangement exists in many animals.

Soleus. An accessory soleus is occasionally seen which arises from the oblique line of the tibia and joins the inner side of the soleus; it covers the posterior tibial artery, and is often of large size.

The soleus has been observed of very small size, the fibular portion alone existing.

It is sometimes inserted into the os calcis separately from the gastrocnemius, an arrangement which is common in many animals. A muscular slip going from the tibia to the tendinous arch over the popliteal vessels has been occasionally seen.

Plantaris. The plantaris, which is rudimentary in man and gradually disappearing, is of large size in some animals, and in them is continuous with the plantar fascia or flexor brevis digitorum. In man it is frequently absent. It sometimes arises by two heads, the supernumerary one coming from the posterior ligament of the knee-joint or from one of the condyles. The writer has seen this supernumerary head arise from the outer head of the gastrocnemius and the middle of the outer surface of the soleus by a tendinous origin.

The plantaris has been seen to arise from the popliteal fascia and fibula. The writer on one occasion saw it arise solely from the posterior ligament of the knee-joint. The mode of its insertion varies, its tendon sometimes joins the tendo Achillis or internal annular ligament, or ends in the deep fascia of the leg. It may send a slip to the plantar fascia (*tensor fasciæ plantaris*). Its tendon may be enclosed in the lower part of the tendo Achillis.

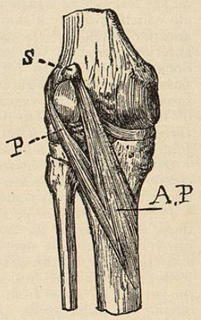

FIG. 3457.—*AP*, Accessory popliteus arising from a sesamoid bone (*S*); *P*, normal popliteus. (Wagstaffe.)

Popliteus. A sesamoid bone is sometimes developed in its tendon of origin. The muscle in rare cases is absent altogether.

Popliteus Minor. Is a small muscle, rarely seen, which arises from the femur internal to the plantaris and is inserted into the posterior ligament of the knee-joint. Wagstaffe has described an accessory popliteus which arose from a sesamoid bone developed in the external head of the gastrocnemius, and was inserted into the oblique line of the tibia superficial to the normal muscle (see Fig. 3457).

Peroneotibialis. This is a muscle described by Gruber, who met with it in one in seven subjects. It arises from the inner side of the head of the fibula, and is inserted into the upper end of the oblique line of the tibia. It is placed beneath the popliteus, and is looked upon as the homologue of the pronator teres in the arm. It is seen in many of the lower animals.

Flexor Longus Digitorum Pedis. This muscle varies somewhat as to its origin. It frequently receives extra slips of origin from the deep fascia and aponeurosis of the leg, the tibia, fibula, or flexor hallucis. The writer has several times seen muscular fibres originating extensively from the deep aponeurosis and flexor hallucis, and crossing the tibialis posticus to reach the flexor digitorum. In some cases the tibialis posticus was completely hidden from view by muscular fibres. A similar arrangement is seen in a great many of the apes. The tendon going to the second toe is sometimes absent; in these cases the second toe receives a slip from the flexor hallucis.

Flexor Accessorius Longus Digitorum Pedis. This muscle and its varieties have been described under various names, as *tibioaccessorius, accessorius ad accessorium* (Turner); *peroneocalcaneus internus* (Macalister); *pronator pedis* (Humphry). It may arise from the tibia or fibula by a fleshy belly and in a well-marked tendon, which passes through a separate compartment in the annular ligament, either in front of or behind the flexor hallucis, and finally ending by joining the flexor accessorius or the tendon of the long flexor before it divides. It has been seen to replace the proper accessorius. In its course down to the foot, its fleshy fibres generally cover over the posterior tibial vessels and nerves. When it arises from the fibula and is inserted into the tubercle of the os calcis, it is called the *peroneocalcaneus internus*, and is looked upon as the homologue of the pronator quadratus of the forearm. The writer has several times seen this muscle arising from the tibia, and only once from the fibula. In one case it arose by two fleshy heads, one from the flexor hallucis, and the other for two inches from the inner border of the tibia immediately below the soleus; the two heads united to form a single belly which, after covering the posterior tibial vessels, ended in a tendon. This tendon passed beneath the annular ligament posterior to the vessels, and in the sole of the foot joined the tendon of the long flexor; the normal accessorius was inserted into this tendon instead of into that of the flexor.

A *flexor proprius digiti secundi*, arising from the tibia and going to the second toe, has been described by Bahnsen.

Flexor Accessorius. The outer head is not infrequently absent. The muscle is sometimes much reduced in size and may even be absent. Its accessory long head has already been described under the name flexor accessorius longus digitorum pedis.

The number of digital tendons to which this muscle can be traced varies considerably. Offsets may be sent to the second, third, and fourth toes, and sometimes to the fifth. In rare cases it can be traced to only two tendons. The muscle has been observed going to the flexor hallucis tendon instead of the digitorum. It sometimes gives off a slip to the fifth toe (as in monkeys), when the slip to that toe from the brevis digitorum is absent.

Lumbricales. Absence of one or more of these muscles occasionally occurs. The writer once saw, on both sides of the same subject, the two outer ones absent. Two are sometimes seen going to one toe. The tendons are frequently inserted into the first phalanges of the toes.

Flexor Hallucis Longus. Seldom varies. The tendons of the digitorum longus and hallucis are seldom completely separated; they are generally united by a slip from the hallucis to the digitorum, and sometimes by one from the digitorum to the hallucis. The slip from the hallucis may generally be traced to the second or third toes, sometimes to all, and sometimes to the second only. In a subject dissected in 1879 by the writer, the tendon of this muscle divided into three tendons, which went to the great, second, and third toes. The longus digitorum divided into four tendons as usual; but those going to the second and third toes were of small size, and joined the ones from the hallucis. The lumbrical muscles were in connection with the digitorum tendons. In this case there was no connection between the tendons of the muscles before division. A slip may be given off from the flexor hallucis in the leg, and after passing under the annular ligament, may join the accessorius. This is a variety of the muscle described above—*flexor accessorius longus digitorum pedis*. In rare cases the tendons of the two long flexors are fused into one, as is seen in the lower animals. The writer once saw a sesamoid bone developed in the tendon of this muscle as it passed over the astragalus and os calcis.

Tibialis Posticus. Very seldom varies. Is occasionally blended more or less intimately with the flexor hallucis. A sesamoid bone is frequently developed in its tendon. It has been described as being inserted into the peroneus longus tendon, second, third, and fourth metatarsal bones, and cuboid. Wood has seen it combine with the flexor brevis hallucis muscles. It has been reported absent by Budge.

Tibialis Secundus. This is a muscle described by Bahnsen, Henle, and Linhart. Henle calls it the tensor of the capsule of the ankle-joint. It arises from the back of the tibia below the flexor digitorum longus, and is inserted into the posterior part of the capsule of the ankle-joint or annular ligament. A similar muscle has been described as being inserted into the anterior part of the capsule of the ankle-joint.

Flexor Brevis Digitorum. The slip going to the fifth toe, which is usually of small size, and very often not perforated by the deep flexor, is sometimes absent altogether. Five tendons have been observed, two going to the second toe. The slip to the little toe, when absent, is occasionally replaced by a small muscle arising from the outer side of the long flexor tendon or flexor accessorius. This arrangement is seen in many of the apes.

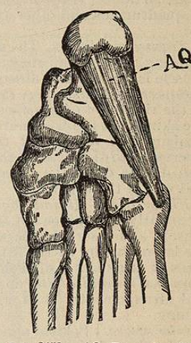

FIG. 3458.—*AQ*. Example of the abductor ossis metatarsi quinti arising from os calcis. (Bradley.)

The tendons of the short flexor may be united to those of the long flexor, and have a common insertion. Some portion of the short flexor may arise from the long flexor tendon. The writer, a few years ago, saw a very good example of this, an arrangement which is like that which exists in apes. The muscle consisted of two portions, superficial and deep; the superficial arose from the inner tuberosity of the os calcis, and divided into two tendons which went to the second and third toes; the deep portion, however, arose by a fleshy origin from the deep flexor tendon before it was joined by the accessorius; its tendons were distributed to the fourth and fifth toes.

Wood mentions a case in which the slip to the fifth toe was augmented by another from the long flexor tendon; they formed a single tendon, which was not perforated but blended with the tendon of the long flexor going to that toe.

Abductor Hallucis. Its tendon is sometimes joined by a muscular slip which comes from the skin in front of the inner ankle. Wood describes a muscular slip from the abductor to the base of the first phalanx of the second toe.

Abductor Minimi Digiti. The tendon is sometimes double.

Abductor Ossis Metatarsi Quinti. A portion of the above has been described, by Wood and Bradley, as a separate muscle arising from the outer tubercle of the os calcis, and inserted into the base of the fifth metatarsal bone; it occurs in about every other subject. Most anatomists look upon this as merely an insertion of the abductor minimi digiti, which fails to exist in about half the subjects examined. Occasionally it exists as quite a separate muscle (see Fig. 3458), having an extensive origin from under the surface of the os calcis. The interest attaching to this muscle lies in the fact that it is the true homologue of a muscle always present in the anthropoid apes.

Flexor Brevis Hallucis. A slip may be sent to the base of the first phalanx of the second toe (Wood). It sometimes receives fibres of origin from the os calcis or long plantar ligament. Occasionally it fails to be attached to the cuboid.

Adductor Hallucis. Occasionally a slip is seen going to the base of the first phalanx of the second toe; this may arise from the second metatarsal bone, or sheath of the tendon of the peroneus longus. Henle thinks it represents the *interosseus volaris primus* of the hand.

Opponens Hallucis (Macalister). Given off from the preceding muscle and inserted into the base of the metatarsal bone of the great toe, as in apes.

Adductor Indicis. The writer once saw a large muscle arise from the cuboid and sheath of the peroneus longus tendon, outside the adductor hallucis, and go to be inserted into the base of the first phalanx of the second toe. This, no doubt, is the homologue of the adductor indicis of quadrumana and other animals, as the sloth, elephant, etc.

Transversus Pedis. The slip from the fifth toe is often wanting, and others may also be absent. The whole muscle is occasionally absent.

Superficial Transversus Pedis. In 1879 the writer saw, in the right foot of a male subject, immediately beneath the skin, a muscle which arose from the bases of the first phalanges of the second, third, and fifth toes, and was inserted into the base of the first phalanx of the great toe; deeper down the normal transversus pedis existed and was of the usual size.

Flexor Brevis Minimi Digiti. A slip of muscle is very frequently seen given off from the inner border of this muscle, and inserted separately into the anterior half of the lateral border of the fifth metatarsal bone. In some cases it is almost a distinct muscle. Henle calls it the *opponens minimi digiti*, and looks upon it as the normal arrangement. It is well developed in the orang-outang.

Interosseous. Seldom abnormal. May vary sometimes in size, according to the size and use of corresponding digit (Wood). A slip is occasionally seen arising from the base of the second metatarsal bone and sheath of the peroneus longus, and inserted into the base of the first phalanx of the second toe. Henle regards this as the homologue of the interosseus volaris primus of the hand.

Muscles of the Trunk.—*Rectus Capitis Posticus Minor.* The writer has once seen this muscle absent on the right side. The left was of large size.

Serratus Posticus Inferior. Macalister has observed absence of this muscle. It may consist of only three slips, or in rare cases there may be as many as five or six from the first to the sixth rib. Slips may be received from the levator anguli scapulæ. I have, in two cases, seen a well-developed muscular slip arising from the mastoid process, beneath the sterno-mastoid, and inserted into the upper border of the serratus posticus superior. Once I noted a slip passing from the fifth cervical transverse process to this muscle.

Serratus Posticus Superior. In rare cases the whole muscle has been absent. Absence of one or more digitations is not infrequent. It is occasionally of larger size than normal. The writer once saw it arise from the four lower dorsal spines, and two upper lumbar, and go to be inserted into the five lower ribs.

Splenius. The extent of origin of the splenius varies. It not infrequently reaches as high as the middle of the ligamentum nuchæ; it may even be attached to the occipital protuberance (as in the bear). In one subject, on both sides, the writer saw the splenii attached to the whole length of the ligamentum nuchæ, the occipital protuberance, the superior curved line of the occipital bone, and the mastoid process. The two muscles presented the appearance of an inverted triangle.

The splenius colli may have a slip of attachment to the third cervical transverse process. The writer has seen it send slips to the second and third cervical, and in one case to the cervicalis ascendens. The splenius capitis may be quite distinct from the splenius colli, or these two portions may be fused together. The colli portion has been reported absent.

Rhombo-atloid (Macalister). Splenius accessorius, adjutor splenii (Walther). This muscle has already been described with the rhomboid. It is a muscular slip going from the transverse process of the atlas to the serratus magnus, rhomboid or serratus posticus superior, and is looked on by Wood as indicating the first degree of differentiation in man toward the formation of the occipito-scapular muscle of the lower animals.

Ligamentum Nuchæ Replaced by Muscle. The writer, in one case, saw the upper part of this ligament replaced by strong muscular fibres, which were attached to the external occipital protuberance, the whole length of the occipital crest, and the posterior tubercle of the atlas and axis. The external border of this muscle consisted of a thick, round tendon, continuous below with the ligamentum nuchæ, which was normal from the spine of the third cervical vertebra.

Sacrolumbalis. The inferior and superior accessory origins of the sacrolumbalis are infrequently absent. The *cervicalis ascendens* may arise as low as the tenth rib, and be inserted as high as the third cervical.

Spinalis Cervicis. This is described by Henle as a normal muscle. It is very inconstant, and arises from the spines of the fifth, sixth, and seventh cervical and upper two dorsal vertebræ, and is inserted into the spine of the axis, and sometimes the spines of the third and fourth cervical vertebræ.

Extensor Coccygis (sacrococcygeus posticus). This is the name given to some slender muscular fibres occasionally seen going from the lower end of the sacrum or the posterior inferior iliac spine to the coccyx. It is the homologue of the great caudal extensor of the lower animals.

Longissimus Dorsi. May vary somewhat as to the number and extent of its attachments. The writer once saw it receive accessory fibres from the spines of the third, fourth, fifth, and sixth dorsal vertebræ.

Spinalis Dorsi. The number of tendons of insertion may be reduced to three; one spine may receive two tendons.

Complexus. The biventer cervicis may be completely fused with this muscle. It may be fused with the trachelo-mastoid or longissimus dorsi. The number of vertebræ to which it is attached may vary from two to seven. A supernumerary fascia sometimes arises from the transverse process of the second dorsal vertebra, and is inserted into the occipital bone beneath the normal muscle. The biventer frequently receives accessory slips from some of the lower cervical or upper dorsal vertebral spines, or from the ligamentum nuchæ. Slips have been seen going to join it from the seventh cervical transverse process.

Multifidus Spinæ. The origin from the seventh cervical vertebra may fail. Muscular slips may run from the necks of the first and second ribs to the fifth and sixth cervical vertebræ, as well as between other ribs and vertebræ.

Interspinales. Longer interspinous bundles are sometimes found passing over one or two vertebræ. In the neck the bundles are broader.

The short *Rotatory* muscles of the neck may be occasionally doubled.

External Intercostals. The last ones are sometimes wanting. Not infrequently they extend as far as the sternum between the costal cartilages. The lower intercostals occasionally are continuous with the external abdominal oblique.

Internal Intercostals. These frequently extend to the vertebral column. The last two are sometimes absent, or so small that it requires a very careful dissection to discover them.

Supracostalis (Wood); *Rectus Thoracis* (Turner). This is a muscle which lies on the upper ribs in the antero-lateral part of the thorax, and generally extends from the first to the fourth rib.

It has been looked upon: (1) as the homologue of the thoracic extension of the rectus abdominis to the first rib, as is seen so often in mammalia, *e.g.*, cat, otter, beaver; (2) as a reproduction in man of the sterno-costal muscles of the lower animals, *e.g.*, dog, badger, etc.; (3) as belonging essentially to the scalene system of muscles, and corresponding to the condition seen in many animals. In the bear the scalene muscles extend back as far as the seventh or eighth ribs. The last view is probably the correct one.

Triangularis Sterni. This muscle varies much as to its extent and points of attachment. Absence of one or both muscles has been noticed. Theile reports a case

in which it extended to the clavicle. It is sometimes continuous with the transversalis abdominis, of which it is supposed to be a remnant or appendage.

Diaphragm. The sternal portion of the muscle is not infrequently wanting (Quain). Carruthers (*Lancet*, 1879) reports a case of absence of the left half of the diaphragm in a child which lived ten days. In this case there was hernia of the small and part of the large intestine into the thorax. Absence of portions of the diaphragm is occasionally seen, and in these cases there is nearly always hernia of some of the contents of the abdomen into the thorax. At a post-mortem held at the Montreal General Hospital in 1885 on a man aged forty, a portion of the left half of the diaphragm was absent, and through the opening the greater portion of the stomach protruded into the thorax.

A fleshy fasciculus has been seen passing from the border of the œsophageal opening to the œsophagus. Knox has described a *musculus hepaticodiaphragmaticus* arising from the left side of the central tendon and passing over the œsophagus to the right, dividing into two slips, one of which went to the under surface of the liver and, becoming tendinous, joined the obliterated ductus venosus and umbilical vein; the other crossed the right crus and was lost in the peritoneum.

Henle and Bourgery describe a muscular slip going from the costal cartilage of the seventh rib partly to the costal cartilage of the ninth, and partly across the middle line of the diaphragm to the opposite border of the sternal portion.

Anomalous Muscle of the Thorax, Connected with the Diaphragm (Subvertebral Rectus of Humphry?) In a well-developed male subject in removing the lung and pleura the writer found a long, flat, ribbon-shaped muscle running down the left side of the bodies of the dorsal vertebræ. It arose from the anterior surface of the head of the sixth and seventh ribs. Becoming broader as it descended, it ended in two slips, one blending with the left arcuate ligament, and the other, which remained muscular with a tendinous intersection, united, by a blending of the two muscles, with the left crus of the diaphragm (*Jour. of Anat. and Phys.*, vol. xxx.).

External Abdominal Oblique (obliquus externus abdominis). According to Macalister, the number of attachments to the ribs varies from six to nine, and one or more slips may be doubled, generally those arising from the eighth and ninth ribs. It is not uncommon to see absence of the highest and lowest digitations. The two lowest may be rudimentary, and an additional fasciculus may come from the lumbar aponeurosis. This muscle may be connected with the serratus magnus, as well as with the pectoralis major, by continuous fibres. The musculus sternalis, when present, may be intimately associated with the external oblique.

A fasciculus has been described going from the ninth rib to the skin over that region (Flesch). This is no doubt a remnant of the dorso-abdominal skin muscle of mammals. Poland ("Guy's Hospital Reports," 1841) reports a case in which the external abdominal oblique became tendinous at a horizontal line on a level with the umbilicus. It was inserted as usual into the ilium and pubis, but had no connection with the linea alba or linea semilunaris; the internal edge of the muscle being external to the semilunar line, and leaving exposed the internal oblique. In this case the external oblique received a special fleshy fasciculus from the eighth rib, near its cartilage.

Internal Abdominal Oblique (obliquus internus abdominis). This muscle, like the preceding, is subject to variations in the extent of its attachments. Its upper or lower attachments may be reduced; it may have an additional slip of insertion into the ninth costal cartilage. A tendinous inscription in the upper part of this muscle has been described as not uncommon; it generally proceeds from the tenth or eleventh rib. Henle describes once finding in the anterior portion of this inscription a short, thin cartilage.

Accessory Abdominal Oblique (M. lateralis abdominis). This is a muscle situated between the two oblique muscles, which arises from the ninth, tenth, or eleventh rib, and passes down to be inserted into the crest of the ilium. The writer once saw this muscle on both sides of the same subject; on the right it arose from the tip of the twelfth, and on the left from the lower border of the eleventh, rib; this latter muscle was not inserted into the iliac crest directly, but blended with the aponeurosis of the external oblique behind and above the anterior superior spine of the ilium. Both muscles became broader as they reached their iliac attachment.

In some cases this muscle is attached to Poupart's ligament or to the sheath of the rectus.

Transversalis Abdominis. The extent of its attachments may vary. Cases are reported in which it was attached to the whole length of Poupart's ligament. The spermatic cord may sometimes pierce its lower border,

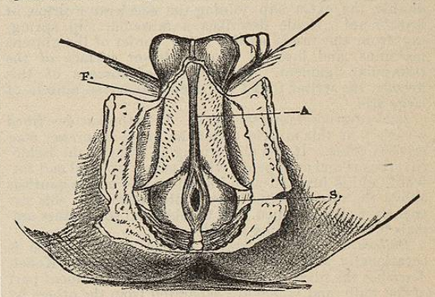

Fig. 3459.—*A*, Sphincter ani continued upward in the middle line and blending with the dartos of the scrotum; *F*, perinæal fascia; *S*, sphincter ani. (Shepherd.)

especially in those cases in which the attachment to Poupart's ligament is more extensive than usual. Fusion of the muscle with the internal oblique has been observed, and total absence has been noticed by Macalister. A tendinous intersection has also been seen.

Rectus Abdominis. In some cases this muscle has been seen extending as high as the third, and even the second, rib. It is not uncommon to see a supernumerary slip going to the fourth rib. In most animals the rectus abdominis extends higher than it does in man; in many it reaches as far as the first rib, *e.g.*, in the bear, otter, beaver, cat, porcupine, etc. The writer once saw a slip go from the upper part of the rectus to the middle of the lower border of the pectoralis major. The number of tendinous intersections may vary; as many as six have been noticed in the negro.

Pyramidalis. This muscle varies much as to size. It is very frequently absent, and is occasionally double. When absent the lower part of the rectus is increased in size. It is a muscle which is of no use in man, and is a mere rudiment of the larger muscle which exists in marsupials. It is absent in many of the lower animals, *e.g.*, solipeds, ruminants, and many of the carnivora, as the dog, cat, bear, etc.

Quadratus Lumborum. Is sometimes attached to the eleventh rib, and to the bodies and transverse processes of the tenth and eleventh dorsal vertebræ. Lange (*Annals of Surgery*," vol. ii., p. 289) figures a quadratus muscle sending a slip to the fascia covering the pleura between the twelfth dorsal and first lumbar rib.

Muscles of the Perineum and Pelvis.—Sphincter Ani. The writer once saw the superficial fibres of this muscle continued up past the tendinous point of the perineum, as a flat muscular slip 6 mm. broad and 5 cm. long. This slip blended above in the middle line with the dartos of the scrotum (see Fig. 3459). Occasionally fibres of the transversus perinæi are inserted into this muscle.

Coccygeus. Is sometimes inserted wholly into the side of the sacrum (Quain).

Sacrococcygeus Anticus (curvator coccygis). This is the name given to a few fleshy and tendinous fibres passing from the lower part of the anterior portion of the sacrum and coccyx. It is well developed in animals with tails.

Transversus Perinæi. This muscle is a very variable one. It is occasionally absent, or so small as to be with difficulty dissected out. It is sometimes inserted either partly or wholly into the accelerator urinæ (bulbocavernosus) muscle or sphincter ani. This muscle is not infrequently fan-shaped, covering the triangular space formed by the three perineal muscles. In these cases the ischiocavernosus forms one edge of the fan. The fibres are inserted into the accelerator urinæ, central tendinous point, and sphincter ani. The muscle is occasionally double, the extra slip joining the accelerator urinæ or levator ani. Henle describes a muscular slip springing from the fascia at the lower border of the gluteus maximus, and inserted into the lower surface of the triangular ligament. In one case of absence of this muscle, the writer found the deep transverse muscle of large size.

Ischiocavernosus (erector penis). Houston has described a variety of this muscle under the name *compressor venæ dorsalis penis.* It is a slip arising in front of the ischiocavernosus and crus penis, which passes upward and forward, and is inserted with its fellow into an aponeurosis above the dorsal vein. The writer once saw this extremely well developed. In the dog and some other animals it is quite a strong muscle.

Bulbocavernosus (accelerator urinæ). This muscle is occasionally joined by the transversus perinæi. Kobelt describes the fibres which cover the most prominent part of the bulb, and which are separated from the others by a more or less distinct interspace, as the *compressor hemisphericum bulbi.* *Francis J. Shepherd.*

MUSCULAR ATROPHIES, PROGRESSIVE.—The presence of muscular atrophy at once suggests to the clinician one of two possibilities, namely:

1. The atrophy is a *symptom.* As such it may indicate injury, hemorrhage, inflammation, or new growth, affecting more or less acutely the oblongata, the spinal cord, or a peripheral nerve; or it may be one expression of joint disease and then due to reflex trophic disturbance in the cord.

2. The atrophy is a *disease.* In other words, it is sufficiently regular in its evolution and constant in its associated symptoms to merit a definite place of its own in our nosology. The scope of the present article is limited to this second group of muscular atrophies, those of the first group being treated under appropriate headings elsewhere in this work.

Our knowledge of muscular atrophy as a clinical entity dates from 1850, when Aran[1] published the first account of what we now recognize as progressive spinal muscular atrophy, although he considered it a disease of the muscles primarily. The disease was elaborated upon by Duchenne a few years later, whence the name "Aran-Duchenne Disease."[10]

The muscular atrophies which are classed as distinct diseases are divisible pathologically into two types, namely:

1. The myopathies or progressive muscular dystrophies; also known as "idiopathic" muscular atrophies, which are characterized by slow premature dissolution of muscle fibres from inherent vital defect. This is a long-recognized tissue condition for which Gowers has recently given us the convenient and expressive term "abiotrophy."[2]

Abiotrophy of the myon would be a concise statement of the pathologico-anatomic status of this group.

2. The myelopathies or "spinal muscular atrophies," characterized pathologically by the same process (premature dissolution) in the spinal motor nerve elements (anterior horn cells or lower motor neurons). Since, however, these same changes often occur also in the cerebral motor neurons (pyramidal motor cells) or in other cases are apparently limited to the peripheral nerves, a more comprehensive designation would be *neuronic muscular atrophy. Abiotrophy of the motor neurons,* therefore, would express the pathologico-anatomic nature of this group.

While this classification serves to define the great majority of cases, a series of mixed forms or so-called "connecting links" between the two main groups is becoming numerous in the literature as experience in their recognition increases, *e.g.*, cases which present symptoms of myopathy and myelopathy combined. These serve to illustrate the anatomical and physiological fact now well recognized, that the entire motor tract from the cortex cerebri to cord and from cord to muscle fibre constitutes a continuous functionating unit, and cannot suffer long in one part without in some degree impairing others.

There seems no good reason, however, to the writer for the use of the term "connecting link" for these cases. The coincident or consecutive involvement of one more segment of the motor tract is all that is necessary to the evolution of these mixed forms, and this may be reasonably postulated in any given case.

Accepting the pathological grouping into myopathic and neuronic, therefore, as the best at present available, we proceed in the order mentioned to consider the individual diseases in each group. The accompanying diagram shows at a glance the anatomical location of the pathological process in the several clinical types (Fig. 3460).

The myopathies or primary atrophies are divided clinically into several "types," somewhat arbitrarily perhaps, since there are good reasons for the view held by many that they are all due to the same pathological processes, differing mainly in location. An exception to this statement, however, must be made in the case of the "pseudo-hypertrophy," which is a prominent feature in one form.

They are all characterized, moreover, by certain clinical features in common, of which the chief are:

1. Hereditary or familial tendency.
2. Onset before puberty.
3. Preponderance in the male sex.
4. Loss of myotatic irritability, and in consequence loss of "tendon reflexes."
5. Electrical changes of reaction of *quantitative* character (diminished response to galvanism and faradism), and absence of typical R. D.

The recognized types of myopathy are:

A. Pseudo-hypertrophic Muscular Atrophy.—*Causation.* The disease begins in childhood; in two-thirds of the cases before the sixth year (Gowers). Heredity is traceable in three-fifths of the cases (Dana). The hereditary influence is strongest through the mother's side, though the *male members* of the family are more frequently affected. Church explains the transmission by the female members of affected families by the fact that the disease renders the males impotent.

The disease is frequently preceded by some acute infection—diphtheria for instance, which probably favors its onset in those already predisposed.

Symptoms.—Weakness in the legs of gradual onset, accompanied by a "waddling" gait and frequent stumbling without evident cause are the earliest symptoms. These are usually noticed about the fifth year and are often attributed to carelessness or stupidity on the part of the child. Later, a noticeable enlargement (pseudo-hypertrophy) of the leg muscles, especially of those of the calves, appears. This may extend to the thighs and gluteal muscles; and the infraspinati are also frequently enlarged. The enlargement of muscles may be slight in some cases, but even in these an undue firmness with lack of elasticity is noticeable on palpation. The shoulder girdle muscles are affected later, while those of the face, forearms, hands, and feet escape for a long time, but are probably affected eventually in most cases that survive a sufficient length of time. Thus in two cases, brothers, aged four-

EXPLANATION OF
PLATE D.