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DISSECTIONS ILLUSTRATED

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*A GRAPHIC HANDBOOK FOR STUDENTS OF
HUMAN ANATOMY*

BY

^{Charles}
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WITH PLATES DRAWN AND LITHOGRAPHED BY
PERCY HIGHLEY

IN SEVENTY-THREE COLOURED PLATES
(FIVE FULL SIZE, THE REST TWO-THIRDS NATURAL SIZE)
AND THIRTY-SEVEN DIAGRAMS

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PREFACE

IN designing these plates the author has had in his mind the valuable assistance rendered to him in the first years of his curriculum by the magnificent plates of Professor Ellis, which, however useful they may be, are too large to be portable, and too expensive for the majority of students to obtain. In order to get over this difficulty, the plates, with the exception of five, instead of being life-size, are reduced by one-third, thus making a convenient and portable book; and it is hoped that the price will place these 'dissections' within the reach of all those who care for a graphic representation of anatomy. A picture or diagram of anatomy is far more useful in fixing the position of parts than a mere written description, and impresses them on the memory in such a manner, that they are easily recalled when engaged in surgical or medical work. The best illustration is the body itself, and it is here that the student must lay, *by careful dissection*, a good and sound foundation of his anatomical work. The author ventures to place these plates before the student as portraying the different structures in their normal positions, which he has to search for and display during his dissections. Thus they will serve as models and, further, will recall the work already done when revising his anatomy previous to an examination. And when, in after years, he has settled down into the staid and prosperous practitioner, the author hopes that, should any anatomical difficulty arise when there is no subject to refer to, these plates may serve to fill a gap by showing the relations of the different structures to one another, and thus recall work long since relegated to the background.

The dissections only aim at showing the ordinary details which any careful worker can dissect out for himself, and not unnecessary minutiae. The various structures have been kept as closely as possible in their normal relations to each other. Finding it impossible in some of the

dissections on the head and neck to crowd all the necessary detail into plates only two-thirds the natural size, full-size ones were substituted, and in order to give a good view of the anterior wall of the abdomen two double plates have been introduced.

The diagrams, upon which much time has been spent, are mostly from original work done by the author during his demonstratorship at the Middlesex Hospital Medical School; those in the First Part—the upper limb—being found too small, the rest have been drawn upon a larger scale and in a bolder method. And here I must express my gratitude to PROFESSOR CUNNINGHAM and DR. ROLLESTON for kindly giving me leave to reproduce diagrams in the ‘abdomen’ (Part IV.), which I hope will prove useful to a better understanding of its anatomy.

To MR. PERCY HIGHLEY great credit is due for the masterly way in which he has both drawn from nature and placed the plates on stone, and for rapidly grasping and representing artistically the intentions of the author. All the bony outlines of the cuts have been drawn from the skeleton, and in introducing the outline of the bones—a new feature—the relative positions of the bony landmarks to the cutaneous tissues have been shown.

To MR. DOBBIN and MR. A. G. NOBLE the author returns sincere thanks for their help in making some of the dissections, the former chiefly in Parts I. and II., and the latter especially in the last Part, where his name will be found conjoined with that of the author.

To MR. R. T. KENT, F.R.C.S., the Dean of the St. Mungo School of Medicine at Glasgow, the author is much indebted for kindly placing at his disposal the necessary material for the dissection of Plate 73.

The author returns his sincere thanks to DR. GUTHRIE, who kindly read through and criticised the letterpress of the last two Parts and made many valuable suggestions as to its revision.

Nor would this Preface be complete without a reference to the great kindness with which the author was treated by his old teacher and friend—the late MR. ARTHUR HENSMAN—both in the granting of material upon which to make the dissections, and in the kindly criticism of the First Part.

C. GORDON BRODIE.

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PLATE I.

THE AXILLA, SUPERFICIAL VIEW.

The cutaneous nerves which supply the front of thorax and upper arm are indicated by black lines in the accompanying diagram, viz.:—
 (a) Sternal, (b) clavicular, (c) acromial branches from the cervical plexus (3 and 4 c); (d) anterior, and (e) lateral cutaneous branches of the intercostals; (f) branches from circumflex; (g) upper branches of the internal cutaneous. The position of the bones is shown in faint outline.

The AXILLA is a pyramidal space with the base directed downwards and outwards, and covered in by dense fascia; and the apex directed upwards and inwards between the clavicle and first rib. The boundaries are:—

In front: Pectoralis major and minor, costo-coracoid membrane, and subclavius muscle.

Behind: Subscapularis, latissimus dorsi, and teres major muscles.

Externally: Coraco-brachialis and biceps muscles, and humerus.

Internally: About five ribs, their intercostals, and five serrations of serratus magnus.

It contains the axillary vessels and brachial plexus of nerves running along its outer wall, with their branches. Lymphatic glands: one set along the line of the vessels receiving the lymph from the arm; another along the edge of the pectoralis major, receiving the lymph from the breast and front of thorax; and a third set along the line of the subscapular vessels, receiving the lymph from the back of thorax. There are also lateral branches of the intercostal nerves, and the space is filled with a packing of fat.

The *intercosto-humeral* nerve, the lateral cutaneous branch of the second intercostal nerve, usually sends a branch to join the nerve of Wrisberg; but if the latter is larger than usual, it will in turn give off one to join the intercosto-humeral, as in the plate.

The *first intercostal* nerve usually sends no lateral cutaneous branch, but it is occasionally present (*vide* Plate III.) and then generally joins the nerve of Wrisberg, giving a twig to join the intercosto-humeral.

The nerve-twig marked (7) is a special branch of the musculo-spiral to the lower fibres of the internal head of the triceps, and from its course parallel to, and being sometimes bound up with, the ulnar nerve, it is called the *ulnar collateral*.

The *posterior* or *long thoracic* is also known as the external respiratory nerve of Bell.

PLATE I.

MUSCLES

A Pectoralis major.	E Latissimus dorsi.
B Pectoralis minor.	F Teres major.
C Serratus magnus.	G Triceps.
D Subscapularis.	H Coraco-brachialis.
	K Deltoid.
	X Placed on the deep fascia of the arm where it receives its slip from the pectoralis major tendon.

VESSELS

a Axillary artery.	h Long thoracic.
b Axillary vein.	i Humeral branch of acromio-thoracic.
c Posterior circumflex.	k Cephalic vein.
d Subscapular.	
e Dorsalis scapulæ.	
	g Perforating branches of internal mammary.
	f Alar thoracic, very large and really forming an external mammary branch.

NERVES

1 Median.	8 Internal cutaneous branch of musculospiral.	14 Anterior branches of intercostal nerves.
2 Internal cutaneous.	9 Circumflex.	15 Communication of nerve of Wrisberg with intercosto-humeral.
3 Lesser internal cutaneous (Wrisberg).	10 Intercosto-humeral.	16 Posterior or long thoracic.
4 Ulnar.	11 Middle or lower subscapular.	17 Upper branch of internal cutaneous to skin of arm.
5 Musculo-spiral.	12 Long subscapular.	18 Anterior division of lateral branch of second intercostal.
6 & 7 Internal muscular branches of musculo-spiral.	13 Lateral branches of the intercostal nerves.	

The axillary artery gives off a number of small branches which supply the areolar tissue and lymphatic glands in the axilla. These have been named alar thoracic, of which one is often enlarged, as in the plate, and, running across the space, supplies the outer border of the mammary gland, and is thus properly named the external mammary artery.

PLATE II.

THE AXILLA, DEEP VIEW.

The pectoralis major has been cut across about its centre, and the ends turned inwards and outwards in order to expose the pectoralis minor and the deeper parts of the axilla. The costo-coracoid membrane was extremely thin, and was removed with the fibro-areolar tissue lying between its lower edge and the upper border of the pectoralis minor; the sheath of the vessels was also removed. It is a deeper dissection of the same axilla, as in Plate I. The plate shows well the doubling up of the fibres of the *pectoralis major* at their insertion, the inferior fibres of origin being folded up so as to lie beneath the upper ones, thus having a higher insertion into the humerus along the outer border of the bicipital groove.

It also shows a fibrous intersection, not uncommonly found running between the *pectoralis minor* and the *coraco-brachialis* muscles from the tip of the coracoid process.

In this body the intercosto-humeral, instead of giving a branch to join the nerve of Wrisberg (6), receives one from it (16), the nerve of Wrisberg being much larger than usual.

The *costo-coracoid* membrane is a fibrous structure, varying much in thickness in different subjects, which is attached above to the borders of the inferior surface of the clavicle, thus enclosing the subclavius muscle. Its lower border is condensed into a fibrous band, the costo-coracoid ligament, which stretches between the cartilage of the first rib and the coracoid process. The membrane is stronger externally, forming a fairly strong band between the clavicle and the coracoid process. Its deep surface is blended with the sheath of the axillary vessels. This latter is funnel-shaped and derived from the deep cervical fascia covering the scaleni muscles.

The costo-coracoid ligament is a representative of the prolonged coracoid element seen in monotremes, etc.; it frequently contains cartilage nodules. (Bland Sutton.)

PLATE II.

MUSCLES

A Pectoralis major, sternal origin.	E Latissimus dorsi.	J Biceps, short head.
A' Pectoralis major, clavicular origin. ¹	E' Tendon of latissimus dorsi.	K Deltoid.
A'' Pectoralis major, insertion.	F Teres major.	L Subclavius.
B Pectoralis minor.	G Triceps, long head.	M Sterno-mastoid.
C Serratus magnus.	H Coraco-brachialis.	X Tip of coracoid process.
D Subscapularis.	I Biceps, long head.	Z Sterno-clavicular joint.

VESSELS

a Axillary artery.	f Thoracic branch of <i>d</i> .	l Dorsalis scapulæ.
b Axillary vein.	g Acromial branch of <i>d</i> .	m Anterior circumflex.
c Superior thoracic.	h Humeral branch of <i>d</i> .	n Cephalic vein.
d Acromio-thoracic trunk.	i Long thoracic.	
e Clavicular branch of <i>d</i> .	k Subscapular.	

NERVES

1 Cords of brachial plexus seen <i>en masse</i> above pectoralis minor.	6 Lesser internal cutaneous.	12 Long subscapular.
2 External or musculo-cutaneous.	7 Musculo-spiral.	13 Posterior thoracic.
3 Nerve to coraco-brachialis from outer cord.	8 Ulnar.	14 Internal anterior thoracic.
4 Median.	9 Internal cutaneous branch of musculo- spiral.	15 External anterior thoracic.
5 Internal cutaneous.	10 Intercosto-humeral.	16 Communication from nerve of Wris- berg to intercosto-humeral.
	11 Middle or lower subscapular.	

¹ The clavicular origin of the pectoralis major has been drawn a little too high on the anterior surface of the clavicle : it should properly occupy nearly the whole of the clavicular surface left exposed between it and the subclavius muscle.

PLAN OF BRACHIAL PLEXUS AS EXISTING IN PLATE III.

The posterior (dorsal) divisions and nerves arising from them are shaded.

(The long subscapular nerve may derive fibres from the 8 C, and the middle from the 7 C. The nerve to the coraco-brachialis came from the 6 C instead of the 7 C, its usual origin.) Both median and ulnar nerves send branches to the metacarpo-phalangeal and phalangeal joints of their respective fingers.

Underneath each nerve is written the numbers of the spinal nerves from which its fibrils are normally derived. Also the chief distribution to muscles, joints and skin.

A SIMPLER PLAN OF BRACHIAL PLEXUS.

PLATE III.

THE BRACHIAL PLEXUS.

This plate illustrates a deep dissection of the axilla and the lower part of the posterior triangle of the neck. The middle third of the clavicle has been removed and the subclavius muscle divided; the weight of the limb has carried it backwards, exposing and tensing the cords of the brachial plexus.

The *posterior scapular* artery arises in this instance from the third part of the subclavian artery: this happens in *about* 40 per cent. of the bodies examined, and thus may be given as one of its normal modes of origin; otherwise, it is usually said to arise from the transversalis colli branch of the thyroïd axis.

The brachial plexus in the plate differs a little from that usually taught, for the anterior branch of the seventh cervical sends a twig to the inner cord of the plexus; this can be traced almost entirely into the median nerve, of which it is really an aberrant root; while the remainder, instead of joining the outer cord, received a communicating branch from it, and ran on by itself to join the median. The external anterior thoracic arose from the sixth and seventh cervical by two distinct roots, and not from the outer cord as is usually given.

Note on the Limb Plexuses.—A few words may be necessary to explain the terms anterior and posterior divisions used in the description of the limb plexuses. Each spinal nerve as it exits from the canal divides into two primary divisions, a dorsal or posterior primary division which supplies the tissues of the back, and an anterior or ventral division which supplies those in the front. It is the anterior (inferior of quadrupeds) primary division that alone enters into the limb plexuses.

To go back to the development of the limb, in its primitive state as it buds out from the trunk it has two surfaces, a ventral and dorsal, each of which has its own nerve supply, and thus the anterior primary division splits at once into two trunks, an anterior or ventral, and a posterior or dorsal, for the supply of the respective surfaces. This simple arrangement is well seen in the *Amphioxus lanceolatus*. In the embryo rat the same thing occurs, all the nerves dividing in this manner, but in the adult rat this arrangement is masked, as development proceeds the embryonic nerves becoming differentiated and complicated in their arrangement *pari passu* with the development of the muscular system, and the changes to the adult condition.

In all mammalian limb plexuses it will be found that:

1. The inferior (anterior) primary divisions of the spinal nerves entering the plexus divide into anterior and posterior trunks.
2. That dorsal trunks always unite with dorsal, and ventral with ventral, to form the nerves of distribution.

3. The essential constitution of a nerve of distribution never varies, i.e. a nerve coming from a dorsal trunk in one animal never comes from a ventral trunk in another.¹

Birmingham considers that the lesser internal cutaneous (N. of Wrisberg) is the posterior or dorsal division of the first dorsal nerve, because when the nerve is absent its place is taken by a lateral cutaneous from first dorsal, the portion of the first dorsal which passes up over the first rib to join the brachial plexus then passing at once into the anterior (ventral) division of the nerves; also the first intercostal does not fully represent the ventral element of first dorsal, because it usually gives no anterior cutaneous branch.²

¹ Dr. Patterson, *Journal of Anatomy and Physiology*, vol. xxi. p. 612.

² *Journal of Anatomy and Physiology*, vol. xxx. p. 63.

PLATE III.

MUSCLES

- A Pectoralis major.
 B Pectoralis minor.
 C Subclavius.
 D Serratus magnus.
 D' Serratus magnus, insertion into the inferior angle of scapula.
 E Subscapularis.
 F Latissimus dorsi.
 G Teres major.

- H Triceps (long head).
 I Short head of biceps.
 K Coraco-brachialis.
 L Long head of biceps.
 M Deltoid.
 N Trapezius.
 O Ono-hyoid (posterior belly).
 P Scalenus medius.
 R Levator anguli scapulæ.

- S Sterno-mastoid.
 T Origin of coraco-brachialis and biceps from the coracoid process.
 V External intercostal.
 W Internal intercostal.
 X Clavicle.
 Y Coracoid process.

- a Subclavian artery.
 b Subclavian vein.
 c Axillary artery.
 d Axillary vein.
 e Brachial artery.
 f Posterior scapular coming off from the third part of subclavian.

- g Cephalic vein (cut end of).
 h Suprascapular.
 i Acromio-thoracic trunk.
 k Long thoracic arising in common with l.
 l Subscapular.
 m Dorsalis scapulæ.
 n Anterior circumflex.

VESSELS

- o Posterior circumflex.
 p Muscular branch to coraco-brachialis.
 r Superior thoracic.
 s External jugular vein.
 t Junction of posterior scapular and suprascapular veins with subclavian.

NERVES

- 1 Branch from fourth cervical to brachial plexus.
 2 Fifth cervical
 3 Sixth cervical
 4 Seventh cervical
 5 Eighth cervical
 6 First dorsal
 7 Outer cord.
 8 Posterior cord.
 9 Inner cord.
 10 Circumflex.
 11 Musculo-spiral.

- 12 Musculo-cutaneous.
 13 Median.
 14 Ulnar.
 15 Internal cutaneous.
 16 Lesser internal cutaneous.
 17 Suprascapular.
 18 External anterior thoracic.
 19 Internal anterior thoracic.
 20 Communicating branch from 18 to 19.
 21 Posterior thoracic.
 22 Lateral cutaneous of first intercostal (rare).

- 23 Lateral cutaneous of second intercostal (intercosto-humeral).
 24 Lateral cutaneous of third intercostal.
 25 Nerve to subclavius.
 26 Branch from 25 to phrenic.
 27 Dorsi-scapular.
 28 Nerve to coraco-brachialis.
 29 Upper subscapular nerve.
 30 Middle subscapular nerve.
 31 Long subscapular nerve.

PLATE IV.

THE BEND OF THE ELBOW.

In this plate is delineated the arrangement of the superficial veins and cutaneous nerves at the bend of the elbow; the basilic vein has been afterwards traced up to the point where it pierces the deep fascia to join the *venæ comites* of the brachial artery.

The common arrangement of these veins is as follows:—the *median vein* (*a*), which begins in radicals over the ball of the thumb, runs up the middle of the forearm, and divides into two about the lower border of the bicipital fascia—an inner branch, the *median basilic* (*e*), and an outer, the *median cephalic* (*b*)—giving off a branch (*k*) which pierces the deep fascia of the arm to join the deep veins. The *median cephalic* is joined just above the outer condyle by the *radial vein* (*c*), which begins in radicals upon the dorsal aspect of the first interosseous space, and runs up the outer side of the forearm posteriorly, turning forwards at the elbow to join the median cephalic. The conjoined vein is then termed *cephalic* (*d*); it runs up along the outer side of the biceps, piercing the fascia opposite the insertion of the deltoid, and, coursing up between this muscle and the pectoralis major, it pierces the sheath of the axillary vessels, and opens into the third portion of the axillary vein. It may communicate with the external jugular by means of a branch passing over the clavicle. The *median basilic*—the inner and usually the larger branch—is joined by the *anterior* (*h*) and *posterior ulnar* veins (*g*), either separately or conjointly, opposite the internal condyle; it is then called the *basilic vein*, and, running up the inner side of the arm, pierces the fascia about the middle, joining the *venæ comites* of the brachial to form the axillary vein. The anterior ulnar vein begins in radicals over the hypothenar eminence (the ball of the little finger), while the posterior begins in radicals upon the dorsal aspect of the fourth interosseous space, receiving the vein of the little finger (*vena salvatella*).

The arrangement of these veins may be likened to an ornamental M, but this is not always well marked.

PLATE IV.

MUSCLES

<p>A Placed on the deep fascia of the arm
over the biceps muscle.</p> <p>B Placed on the semilunar or bicipital
fascia.</p> | <p>C Deep fascia of the forearm.</p> <p>X Position of the lowest superficial
lymphatic gland in upper limb.</p> |
|---|---|

VESSELS

a Median vein. b Median cephalic. c Radial vein. d Cephalic vein. e Median basilic. f Ulnar veins, common trunk.	<p>g Posterior ulnar veins.</p> <p>h Anterior ulnar vein.</p> <p>k Communication of median with deep
veins.</p> <p>l Basilic vein.</p> |
|--|--|

NERVES

1 Internal cutaneous, anterior division. 2 Internal cutaneous, posterior division. 3 External cutaneous. 4 Posterior branch of external cutaneous.	<p>5 Upper external cutaneous branch of
musculo-spiral.</p> <p>6 A twig from the internal cutaneous,
supplying the skin in front of biceps.</p> <p>7 Nerve of Wrisberg.</p> |
|--|---|

It may be taken as a general rule that the external cutaneous nerve passes beneath the median cephalic vein, and that one or two branches of the internal cutaneous nerve usually pass over the median basilic, while the others pass beneath it.

It is important to remember that the median basilic vein is only separated by the bicipital fascia from the brachial artery which lies beneath it; and thus, in the olden days when bleeding was the fashion, the artery was frequently injured, and arterio-venous aneurisms were not uncommon.

Supra-condyloid lymphatic gland.—This, the lowest lymphatic gland (or glands) in the arm, is placed about an inch above the internal condyle, along the course of the basilic vein; it receives all the lymphatics from the ulnar side of the forearm and fingers, and most of those from the radial; some lymphatics from the latter, however, running up along the cephalic vein to reach the glands in the axillary space.

PLATE V.

THE INNER VIEW OF ARM AND BRACHIAL ARTERY.

The cutaneous nerves of the front of the arm are (a) circumflex; (b) intercosto-humeral, just along the anterior fold of the axilla; (c) the internal cutaneous, a branch of which pierces the fascia above the main nerve; (d) the upper external cutaneous branch of the musculo-spiral; (e) the lesser internal cutaneous; (f) the external cutaneous.

The *inferior profunda* artery is occasionally absent, and is also very variable in size and origin, and may arise in conjunction with the superior profunda, then running down with the ulnar nerve. In the plate it is shown arising by two trunks, one which has been called the inferior profunda (f) (firstly because it arises from about the normal place of origin, and secondly because it pierces the internal intermuscular septum), the other which is called an accessory branch (e), and arises from the superior profunda.

Another branch of the brachial, the *vas aberrans*, 'usually present, but often as a minute vessel, not admitting complete injection, arises close to or with the superior profunda, and descends over the median nerve supplying the biceps. Its downward continuation, when present, joins either the radial artery, or more rarely the ulnar, and may be minute, moderate or large enough to replace, or simulate the brachial, which then appears to overlie the median nerve. When of moderate size, it may replace the brachial origin of the radial (rarely the ulnar), giving rise to the common condition called high bifurcation of the brachial.' (Macalister.)

Note on the Coraco-brachialis.—Professor Wood¹ has shown that in mammals this muscle consists of three portions:—1. The coraco-brachialis brevis, represented in man by a fibrous arch, rarely by muscle, arising from the coracoid process and inserted into the humerus just below the subscapularis. 2. The coraco-brachialis medius, or the coraco-brachialis of man. 3. The coraco-brachialis longus arises with the medius, being connected at its origin with the pectoralis minor, and passes down internal to it to join the internal intermuscular septum, in which it is usually traceable as far as the internal condyle. It is usually represented in man by a fibrous band passing from the lower part of the muscle to the intermuscular septum. The coraco-brachial apparatus is found best developed in those animals 'which use the fore limbs for prehension, climbing, swimming, digging, etc., and appears to refer more to the wants and habits, than the pedigree or relationship of the animal.' The musculo-cutaneous nerve may either pierce the medius, or more usually it passes between the medius and longus.

¹ *Journ. of Anat. and Phys.* vol. i.

PLATE V.

MUSCLES

A Pectoralis major.	E Teres major.	I Brachialis anticus.
B Biceps, long head.	F Latissimus dorsi.	K Pronator radii teres.
C Biceps, short head.	G Triceps, long head.	L Bicipital fascia.
D Coraco-brachialis.	H Triceps, internal head.	X Internal intermuscular septum.

VESSELS

a Axillary artery.	e An accessory branch, arising with superior profunda, and running down with the ulnar nerve to innoscuate with the inferior profunda.	f Inferior profunda.
b Axillary vein.		h Anastomotica magna.
c Brachial artery.		k Junction of basilic vein with venæ comites of brachial.
d Superior profunda.		

NERVES

1 Median.	5 Musculo-spiral.	8 Internal cutaneous branch of 5.
2 Internal cutaneous.	6 Ulnar collateral branch of 5.	9 Branch of median to pronator radii teres.
3 Ulnar.	7 Internal muscular branch of 5.	
4 Lesser internal cutaneous		

This plate shows how completely the brachial artery may be overlapped in the middle of its course by the edge of the biceps muscle ; this should be borne in mind in ligation of the artery. The subject was a fairly muscular man of thirty years.

PLATE VI.

THE FRONT OF THE FOREARM, FIRST VIEW.

This is a superficial dissection of the muscles on the front of the forearm. The bicipital fascia was left to show how it braces the muscles together, and in a muscular subject has a constricting influence upon the contour of the inner side of the forearm. The external cutaneous nerve was not cleared away with the other subcutaneous structures, in order to show its communication with the radial; but it must be remembered that, although it appears to lie upon the muscles, yet it is separated from them by the deep fascia of the forearm which has been removed.

The accompanying sketch shows the cutaneous nerve-supply of the anterior surface of the forearm and hand: (a) Internal cutaneous; (b) posterior branch of external cutaneous; (c) external cutaneous; (d) palmar cutaneous of the median; (e) palmar cutaneous of the ulnar; (f) digital branches of the median; (h) digital branches of the ulnar.

The *palmaris longus* is one of the most variable muscles in the body, and may be absent, being then replaced by a fibrous band which occupies the normal position of the muscle.

PLATE VI.

MUSCLES

A Biceps.	K Flexor carpi ulnaris.
B Brachialis anticus.	L Flexor longus pollicis.
C Triceps.	M Tendon of extensor ossis metacarpi pollicis.
D Supinator longus.	N Tendon of extensor primi internodii pollicis.
E Extensor carpi radialis longior.	O Pronator quadratus.
F Pronator radii teres.	X Bicipital fascia.
G Flexor carpi radialis.	Z Lower end of radius.
H Palmaris longus.	
I Flexor sublimis digitorum.	

VESSELS

a Brachial artery.	e Radial artery.
b Venæ comites of brachial.	f Anterior carpal.
c Anastomotica magna.	g Superficialis volæ.
d Communicating branch between superficial and deep veins.	h Ulnar artery.

NERVES

1 Median.	4 Radial.
2 Branch of median to pronator radii teres.	5 Branch of communication between radial and external cutaneous.
3 External cutaneous.	6 Palmar cutaneous branch of median.
7 Ulnar.

PLATE VII.

FRONT OF FOREARM, SECOND VIEW.

This is a deeper view of Plate VI. from the same arm. The palmaris longus and flexor carpi radialis have been cut away to show the flexor sublimis digitorum ; and the inner edge of the supinator longus pulled a little outwards in order to expose the radial artery in the whole of its course in the forearm, and also the extensor carpi radialis longior which lies beneath it.

PLATE VII.

MUSCLES

A Biceps.	I' Tendon of flexor carpi radialis.
B Brachialis anticus.	K Flexor sublimis digitorum.
C Triceps.	L Flexor carpi ulnaris.
D Supinator longus.	M Flexor longus pollicis.
E Extensor carpi radialis longior.	N Pronator quadratus.
F Supinator brevis.	O Tendon of extensor ossis metacarpi pollicis.
G Pronator radii teres.	P Tendon of extensor primi internodii pollicis.
H Palmaris longus.	Z Placed on the lower end of <i>radius</i> .
H' Tendon of palmaris longus, cut.	
I Flexor carpi radialis.	

VESSELS

a Brachial artery.	f Anterior carpal.
b Anastomotica magna.	g Superficialis volæ.
c Radial artery.	h Ulnar artery.
d Radial recurrent.	i Muscular branch from ulnar to flexor carpi radialis and palmaris longus.
e Anterior terminal branch of superior profunda.	

NERVES

1 Median.	6 Radial.
2 Branch of median to pronator radii teres.	7 Posterior interosseous.
3 Branch of median to flexor carpi radialis and palmaris longus.	8 Muscular branch of musculo-spiral to supply the extensor carpi radialis longior.
4 External cutaneous.	9 Palmar cutaneous of median.
5 Musculo-spiral.	10 Ulnar.

The branch of the musculo-spiral nerve which supplies the supinator longus was situated just out of sight along the outer side of the musculo-spiral trunk, and could not be indicated. It is shown in Plate XV.

PLATE VIII.

FRONT OF FOREARM, THIRD VIEW.

This shows a still deeper dissection of the front of the forearm. The flexor sublimis digitorum has been cut away from its radial origin, and its origin from the internal condyle, internal lateral ligament, and coronoid process turned inwards; its tendons have been cut short at the wrist, showing the order in which they pass under the annular ligament. The ulnar artery is thus also exposed with the deep layer of muscles. The relation of the median nerve to the ulnar artery is well shown as the nerve passes between the two heads of the pronator radii teres. If a comparison be made between the radial artery in Plate VII. and the ulnar in this plate, it will be clearly seen how superficial the radial lies and how easily it is reached by merely turning back the edge of the supinator longus, whilst the ulnar is placed deeply and is not nearly so accessible, lying as it does beneath the pronator and the flexor muscles arising from the internal condyle of the humerus.

Look out carefully for an occasional fusiform slip of origin of the flexor longus pollicis, which arises from the ulna just below the deep origin of the pronator radii teres, and runs down to join the ulnar border of the long flexor of the thumb. This is, according to Professor Macalister, the remains of the obsolete superficial flexor of the thumb.

After finishing this layer of muscles, cut away the flexores profundus digitorum and longus pollicis, and examine the pronator quadratus which lies beneath them covered in by a special fascia of transverse fibres, in which, towards the radial side, are usually to be seen a number of glistening longitudinal ones; they are the degenerate remains of a muscle called the flexor carpi radialis brevis (Wood), which in its fully developed state arises from the radius just above the pronator, and, passing down, is inserted into the second or third metacarpal bone, or, aborting, is attached to one of the carpal bones or fibrous tissue in front of the carpus.

PLATE VIII.

MUSCLES

A Biceps.	J Flexor carpi ulnaris.
B Brachialis anticus.	K Flexor profundus digitorum.
C Triceps.	L Flexor longus pollicis.
D Pronator radii teres, superficial origin.	M Supinator longus.
E Pronator radii teres, deep origin.	N Pronator quadratus.
F Flexor carpi radialis.	O Extensor carpi radialis longior.
F' Tendon of flexor carpi radialis.	P Tendon of extensor ossis metacarpi pollicis.
G Palmaris longus.	R Tendon of extensor primi internodii pollicis.
G' Tendon of palmaris longus.	X Placed over the edge of the trochlear surface of humerus, which is covered by the brachialis anticus.
H Flexor sublimis digitorum, origin from internal condyle, etc.	Z Placed on the lower end of the radius.
H' Tendons of the flexor sublimis: i. index, ii. middle, iii. ring, iv. little finger.	
I Radial origin of flexor sublimis digitorum.	

VESSELS

a Brachial artery.	f Anterior ulnar recurrent.
b Radial artery.	g Posterior ulnar recurrent.
c Ulnar artery.	h Anterior interosseous.
d Anastomotica magna.	i Comes nervi mediani.
e Radial recurrent.	k Anterior carpal from radial.
- l Superficialis volæ.

NERVES

1 Median.	8 Continuation of anterior interosseous to pronator quadratus.
2 Nerve to pronator radii teres from median.	9 Ulnar.
3 Branch of median to flexor sublimis.	10 Branch of ulnar to flexor profundus digitorum.
4 Branch of median to palmaris longus and flexor carpi radialis.	11 Branch of ulnar to flexor carpi ulnaris.
5 Anterior interosseous.	12 Dorsal branch of ulnar.
6 Branch of anterior interosseous to flexor profundus digitorum.	13 Musculo-spiral.
7 Branch of anterior interosseous to flexor longus pollicis.	14 Radial.
	15 Posterior interosseous.
	16 External cutaneous.
- 17 Palmar cutaneous of median.

PLATE IX.

THE PALMAR FASCIA.

This plate shows a superficial dissection of the lower part of the forearm, and palm of the hand. The tendon of the palmaris longus after perforating the deep fascia of the forearm is continued into the palmar fascia, which may be spoken of as an expansion of its tendon. The palmaris brevis which arises from its inner border is the remnant of the large muscular palmaris longus which exists in the armadillo, etc., and is there muscular in the whole of its extent.¹ The palmar fascia with the palmaris brevis is easily reflected from the underlying structures on the ulnar side of the hand, but on the radial side the fascia is bound down to the annular ligament at the point where it blends with the origin of the abductor and outer head of the flexor brevis pollicis.

The *palmar fascia*, as seen in the plate, is strong and triangular, being composed chiefly of longitudinal fibres, continuous above with those of the tendon of the palmaris longus, while below they divide into four digital slips which pass along the middle line of the finger, and are closely connected with the skin over the first phalanx. The four digital slips are tied together by transverse fibres, which are collected, opposite the metacarpo-phalangeal joint, into a well-marked bundle called the superficial transverse ligament; each slip also gives off from its deep surface two prolongations which descend on either side of the flexor tendons to be attached to the glenoid plates and edges of the metacarpal bone. An arch is thus formed through which the flexor tendons pass, while between the arches the digital nerves and arteries, and the lumbricals pass to their destination. 'It is the degenerate perforated flexor of the first phalanges.' (Macalister.)

¹ For further information, see the *Morphology of Ligaments* by Mr. J. Bland Sutton.

PLATE IX.

MUSCLES AND FASCIÆ

A Tendon of the palmaris longus. B Palmaris brevis. C Palmar fascia.		D Deep fascia of the forearm. E Placed over the pisiform bone. F Annular ligament.
G Superficial transverse ligament.		

VESSELS

<i>a</i> Ulnar artery. <i>b</i> Superficialis volæ. <i>c</i> Radialis indicis.		<i>d</i> Digital branches of the superficial palmar arch. <i>e</i> Median vein.
<i>f</i> Anterior ulnar vein.		

NERVES

1 Anterior division of the external cutaneous. 2 Anterior division of the internal cutaneous. 3 Ulnar. 4 Palmar cutaneous branches of the		ulnar piercing the palmaris brevis and supplying it. 5 Palmar cutaneous branch of the median. 6 Digital branches of the ulnar. 7 Digital branches of the median.

N.B. In the plate the digital slip of the palmar fascia to the index finger is broader than is usually the case.

PLATE X.

SUPERFICIAL PALMAR ARCH, ETC.

In this dissection the palmaris brevis and the greater portion of the palmar fascia have been removed, leaving only the outer edge of the fascia to show where it blends with the origin of the abductor pollicis, and outer head of the flexor brevis pollicis.

The *superficial palmar arch* may be completed in three ways: (1) most commonly by the inosculation of the superficial branch of the ulnar with the radialis indicis of the radial; or (2) by inosculation with the superficialis volæ; *occasionally* (3) by both.

The position of the superficial arch may be marked on the palm, by extending the thumb and drawing a line *a b* from its web across the palm: this will indicate the summit of the arch. The deep palmar arch is generally about a finger's breadth higher up.

(In the outline the artist has not carried the superficial arch quite low enough down.)

(*e*) radial artery; (*d*) ulnar artery; (*e*) superficialis volæ; (*f*) radialis indicis.

The diagram also shows in shaded lines the common arrangement of the *synovial sheaths* of the tendons in the palm, and it will be seen that while the sheaths of the index, middle, and ring fingers are shut off from the common synovial membrane of the flexor tendons at the wrist, about the level of the metacarpo-phalangeal joint, that of the little finger is continuous with it; the flexor tendon of the thumb has, as a rule, a sheath to itself running down under the annular ligament, but in some cases communicating with the other sheath at the wrist.

Thus inflammation in the sheath of either the thumb or little finger has a clear path to spread down under the annular ligament, and may do a considerable amount of damage.

PLATE X

MUSCLES

<p>A Abductor pollicis.
 B Flexor brevis pollicis, outer head.
 C Adductor transversus pollicis.
 D First dorsal interosseous (abductor indicis).
 E Lumbricales.
 F Abductor minimi digiti.
 G Flexor brevis minimi digiti.
 H Opponens or flexor ossis metacarpi minimi digiti.
 I Flexor carpi ulnaris.
 K Flexor sublimis digitorum tendons: ii. middle, iii. ring, iv. little finger.
 L Flexor profundus digitorum.</p> | <p>M Palmaris longus.
 N Flexor carpi radialis.
 O Supinator longus.
 P Extensor ossis metacarpi pollicis.
 Q Extensor primi internodii pollicis.
 R Pronator quadratus.
 S Vaginal portion of sheath of flexor tendons.
 S' Crucial portion of sheath.
 T Vinculum accessorium longum.
 V Arch formed by deep prolongation of the palmar fascia.
 X Annular ligament.
 Z Pisiform bone.</p> |
|---|--|

VESSELS

<p><i>a</i> Radial artery.
 <i>b</i> Superficialis volæ.
 <i>c</i> Ulnar artery.
 <i>d</i> Deep branch of ulnar.
 <i>e</i> Digital branches of the superficial palmar arch.</p> | <p><i>f</i> Radialis indicis.
 <i>g</i> Princeps pollicis.
 <i>h</i> Interosseous branches of the deep arch joining the digital at their point of bifurcation.</p> |
|---|--|

NERVES

<p>1 Median.
 2 Palmar cutaneous of median.
 3 Digital branches of median.
 4 Branch to muscles of thumb.
 5 Branches to outer two lumbricales.</p> | <p>6 Ulnar.
 7 Deep branch of ulnar.
 8 Digital branches of ulnar.
 9 Communication between ulnar and median.</p> |
|---|---|

PLATE XI.

THE DEEP PALMAR ARCH AND MUSCLES OF PALM.

In this dissection of the palm, the superficial arch, median nerve, flexor tendons, and lumbricales have been removed in order to show the deep arch. The annular ligament has also been divided, and the tendons cut off and left to show their relative position whilst passing under it.

Note on the Short Muscles of the Thumb.—The so-called inner head of the flexor brevis pollicis—at least, the part visible in the plate—is better named the adductor obliquus, because Von Bischoff has shown that the true inner head of this muscle is a small slip which arises from the base of the first metacarpal bone, and passes to be inserted into the ulnar sesamoid bone of the thumb; whereas the rest of the mass, which usually is known as the inner head of the flexor brevis, is in reality an oblique adductor, while the so-called adductor of Gray, etc., should be called the adductor transversus. A table can thus be established, comparing the muscles of the thumb with those of the great toe:—

Abductor pollicis with the abductor hallucis.

Adductor transversus pollicis with the adductor transversus hallucis (transversus pedis).

Adductor obliquus pollicis with the adductor obliquus hallucis (the ordinary adductor).

Flexor brevis pollicis with the flexor brevis hallucis.

a Radial head.

a Tibial head.

b Interosseus primus volaris.

b Fibular head.

The flexor ossis metacarpi (opponens) pollicis has no homologue in the human foot; it is really a segmentation of the outer head of the flexor brevis pollicis; but in the orang an opponens hallucis, which is closely connected with the flexor brevis hallucis, has been described. The interosseus primus volaris is the true ulnar head of the flexor brevis pollicis.

This classification is taken from a paper by Dr. Cunningham in the 'Report of the Challenger Expedition,' vol. v. p. 187, to which the reader must be referred for more information, as well as to an excellent paper by Dr. St. John Brooks in the *Journal of Anatomy and Physiology*, vol. xxii.

PLATE XI

MUSCLES

<p>A Abductor minimi digiti.
 B Flexor brevis minimi digiti.
 C Opponens or flexor ossis metacarpi minimi digiti.
 D Abductor pollicis.
 E Flexor brevis pollicis, outer head.
 F Opponens or flexor ossis metacarpi pollicis.
 G Adductor obliquus pollicis (inner head of flexor brevis pollicis).
 H Adductor transversus pollicis.
 I Dorsal interossei.
 K Palmar interossei.</p> | <p>L Tendons of flexor sublimis digitorum :
 i. index, ii. middle, iii. ring, iv. little finger.
 M Tendons of flexor profundus digitorum.
 N Tendon of flexor longus pollicis.
 O Cut edge of annular ligament.
 P Lumbricales.
 Q Deep transverse ligament, joining.
 R Glenoid plates.
 X Placed on pisiform bone.
 Y Placed on hook of unciform bone.
 Z Anterior ligament of wrist joint.</p> |
|--|--|

VESSELS

<p>a Ulnar artery.
 b Deep branch of ulnar.
 c Deep palmar arch.
 d Interosseous branches of deep arch.</p> | <p>e Digital branches of superficial arch.
 f Radialis indicis.
 g Princeps pollicis.
 h Recurrent branch of deep palmar arch.</p> |
|---|--|

NERVES

<p>1 Ulnar.
 2 Deep branch of ulnar.</p> | <p>3 Muscular twigs to two inner lumbricales.
 4 Muscular twig to third palmar interosseous.</p> |
|--|--|

PLATE XII.

THE BACK OF SHOULDER.

This plate shows a superficial dissection of the muscles at the back of the shoulder, and also the nerves and vessels of the arm from behind, the arm having been strongly rotated inwards.

The cutaneous nerves which supply this region are:—(a) Acromial branches of the third and fourth cervical nerves; (b) cutaneous branches of the posterior primary divisions of the spinal nerves; (c) posterior twigs of the lateral branches of the intercostals; (d) circumflex; (e) internal cutaneous branch of musculo-spiral; (f) intercosto-humeral.

The internal cutaneous branch of the musculo-spiral, as shown in the plate, was smaller than usual, and only supplied the skin about half-way down the back of the arm instead of nearly reaching the olecranon, as generally described. The branches of the intercosto-humeral, on the other hand, were large, and supplied the skin nearly down to the olecranon. The usual branch of communication between the intercosto-humeral and internal cutaneous of the musculo-spiral could not be found.

There is generally a fibrous band uniting the tendon of the latissimus dorsi and the scapular head of origin of the triceps, which is the remains of a muscle—the dorsi-epitrochlearis.

PLATE XII.

MUSCLES

A Trapezius.	F Placed on fascia covering in the infra-spinatus.	I Triceps (long head).
B Rhomboideus major.	G Placed on fascia covering in the teres minor.	K Biceps.
C Latissimus dorsi.	H Deltoid.	V Placed on spine of scapula.
D Teres major.		X Placed on acromion process.
E External intercostals.		

VESSELS

a Brachial artery.	e Branches from the dorsal divisions of intercostals.	h Inferior profunda artery coming off rather higher than usual from the brachial.
b Axillary vein.	f Cutaneous branch from the posterior circumflex artery.	
c Superior profunda artery.		
d Branches of dorsalis scapulae.		

NERVES

1 Median.	6 Musculo-spiral.	9 Ulnar collateral: <i>vide</i> Plate I.
2 Ulnar.	7 Internal cutaneous branch of the musculo-spiral.	10 and 11 Branches of the intercosto-humeral.
3 Lesser internal cutaneous.	8 Internal muscular branches of the musculo-spiral.	12 Cutaneous branches of the circumflex.
4 Internal cutaneous.		
5 Upper branches of the internal cutaneous.

PLATE XIII.

THE CIRCUMFLEX NERVE AND SCAPULAR QUADRILATERAL.

In this dissection the attachment of the deltoid to the spine of the scapula has been cut through and the spine sawn across at its junction with the acromion process; the whole muscle and bone were then turned outwards, to expose the circumflex nerve and posterior circumflex artery.

When viewed from the back, with the arm abducted from the side, the quadrilateral space or scapular quadrilateral is formed by the bone above, the long head of the triceps below, externally by the teres major, and the teres minor internally; but seen from the front, the teres minor is replaced by the axillary border of the subscapularis. Coming through the space are the posterior circumflex vessels and circumflex nerve.

The branch of the circumflex artery marked (*g*) passes down to anastomose with one from the superior profunda, and it is this branch that usually enlarges and takes the place of the circumflex when, in abnormal conditions, that artery is not given off from the axillary, or *vice versa*.

The circumflex nerve is a good illustration of Hilton's law, that the main nerve to a joint not only supplies it, but also some of the muscles which act on the joint, as well as the skin over those muscles, thus securing during movement the true balance of force and friction.

The fibres of origin of the infra-spinatus from the spine of the scapula overlap the upper portion of the origin from the infra-spinous fossa.

PLATE XIV.

THE BACK OF THE ARM AND MUSCULO-SPIRAL NERVE.

This plate shows a dissection to expose the musculo-spiral nerve as it lies in the musculo-spiral groove. The long and external heads of the triceps have been detached from the common tendon below, and turned outwards; the fascial expansion, which comes off from the lower and external part of the triceps, and covers the anconeus, has been partly reflected to expose that muscle. The nerve to the anconeus has been traced through the fibres of the internal head of the triceps.

The cutaneous nerve-supply of the back of the arm is shown in the adjoining diagram:—(a) Acromial branches of cervical nerves; (b) cutaneous branches from circumflex; (c) upper, and (d) lower external cutaneous branches of the musculo-spiral; (e) internal cutaneous branch of the musculo-spiral; (f) intercosto-humeral; (g) nerve of Wrisberg; (h) posterior branch of the internal cutaneous.

The close proximity of the musculo-spiral nerve to the bone, as it lies in the musculo-spiral groove, should be noted, as it is thus rendered liable to pressure-injuries: *e.g.* pressure of a badly-made crutch may produce paralysis, the so-called 'crutch-palsy.'

During the dissection of this region, do not forget to examine the course of the ulnar nerve behind the internal condyle, which it grooves, lying against the internal lateral ligament before it passes into the forearm between the two heads of the flexor carpi ulnaris. Whilst in the groove it is covered by a band of fibrous tissue which passes across from the back of the condyle to the olecranon: this is the degenerate remains of a muscle, the epitrochleo-anconeus, which exists pretty constantly in the lower mammals, including a few of the primates, but is not seen in the anthropoid apes.

It is also important to remember the relation of the ulnar nerve to the joint in excising the elbow, lest it should be damaged during the operation.

PLATE XIV.

MUSCLES

A Deltoid.	K Fascia covering anconeus, reflected.	from its origin from the border of anconeus to show T.
B Teres minor.	L Brachialis anticus.	S External condyle.
C Teres major.	M Biceps.	T Placed over head of radius.
D Latissimus dorsi.	N Supinator longus.	Y External intermuscular septum.
E Long head of triceps.	O Extensor carpi radialis longior.	X Shaft of humerus.
F External head of triceps.	P Common tendon of extensor muscles.	Z Olecranon.
G Internal head of triceps.	R Edge of extensor carpi ulnaris, detached	
H Anconeus.		

VESSELS

a Brachial artery.	d Its anastomotic branch to posterior circumflex.	h Anterior terminal division of superior profunda.
b Axillary vein.	e Posterior terminal division of the superior profunda.	g Inferior profunda.
c Superior profunda.		

NERVES

1 Musculo-spiral.	4 Upper external cutaneous branch, piercing the external head.	6 Nerve to anconeus, also giving twigs to internal head.
2 Its muscular branch to long head of triceps.	5 Lower external cutaneous branch passing over the external intermuscular septum.	7 Muscular branches to internal head of Ulnar.
3 Its muscular branch to external head of triceps.		8 Ulnar.
		9 Lesser internal cutaneous.

PLATE XV.

THE SUPERFICIAL DISSECTION OF THE BACK OF THE FOREARM.

This plate shows a superficial dissection of the muscles on the back of the forearm. The cutaneous nerves are shown in the sketch plan :—(a) External cutaneous of the musculo-spiral; (b) nerve of Wrisberg; (c) posterior branch of external cutaneous; (d) posterior branches of internal cutaneous; (e) dorsal branch of the ulnar; (f) radial; (g) twigs from the digital branches of the median; (h) twigs from the palmar digital branches of the ulnar, supplying the lateral aspect of the fingers. The diagram Plate XVII. shows more clearly the nerve-supply to dorsum of hand and fingers.

Note on the Anconeus.—This muscle is usually supposed to be a segmentation of the lower part of the triceps, both on account of its nerve-supply from the musculo-spiral, and also the continuity of the lower fibres of the triceps with it; but, on the other hand, in some lizards the anconeus is separate from the triceps, forming a portion of the extensor carpi ulnaris, and its nerve (a branch of the musculo-spiral) supplied also the supinator brevis, afterwards joining the posterior interosseous, and helping to supply the extensors of the fingers. In the alligator, the extensor carpi ulnaris is absent, a large anconeus doing its work, having a double nerve-supply, viz. from the musculo-spiral and posterior interosseous; this has been noted by Luschka as occurring in man. It may be concluded, therefore, that this muscle is more allied to the extensor carpi ulnaris than the triceps, and that its nerve originally took a larger share in the supply of the muscles on the extensor aspect of the forearm.¹

It may also be added that the extensor carpi ulnaris arises from the fascia covering the anconeus for a short distance.

¹ The President: *Proc. Roy. Acad. Med. in Ireland*, 1898.—*Lancet* report.

PLATE XV.

MUSCLES

A Triceps.	I Extensor communis digitorum.
B Anconeus.	K Extensor minimi digiti.
C The fascial expansion from the triceps covering the anconeus, cut and turned back.	L Extensor carpi ulnaris.
D Biceps.	M Extensor ossis metacarpi pollicis.
E Brachialis anticus.	N Extensor primi internodii pollicis.
F Supinator longus.	O Extensor secundi internodii pollicis.
G Extensor carpi radialis longior.	X Annular ligament.
H Extensor carpi radialis brevior.	Y Placed on lower end of ulna.
	Z Placed on lower end of radius.

VESSELS

a Posterior terminal branch of superior profunda.	c Termination of the posterior inter- osseous (rather larger than usual).
b Anterior interosseous, posterior terminal branch.	

NERVES

1 Radial.	2 Dorsal branch of ulnar.
-----------	---------------------------

The extensor minimi digiti can only be said to arise from the external condyle by virtue of its origin from the intermuscular septum between the extensor communis and extensor carpi ulnaris which is attached there.

PLATE XVI.

THE DEEP DISSECTION OF BACK OF FOREARM.

In this dissection the *extensores communis digitorum*, *minimi digiti*, and *carpi ulnaris* have been cut away to expose the deep layer of muscles in the forearm, and the posterior interosseous artery and nerve.

Note on the Extensor medius.—A separate tendon to the middle finger is not uncommon; it usually arises by a muscular belly attached to the posterior surface of the ulna below the extensor indicis; its tendon runs down through the same compartment of the annular ligament as the extensor communis digitorum, but deep to it, and joins the common extensor tendon of the middle finger in the same way as the extensor indicis joins with that of the index finger.

Thus the extensor tendons may be divided into two sets—a *common set*, which is superficial (the extensor communis digitorum); and a *special set*, of which the extensor minimi digiti is superficial and constant, the extensor indicis deep and constant, the extensor medius deep and fairly frequent; the only one missing being the extensor annularis, which is very rare; but, as Mr. Sutton has pointed out, if the fascia of the forearm be carefully examined, a thin glistening band of tendinous fibres will be seen lying in it, in the intermuscular septum between the extensor carpi ulnaris and the extensor minimi digiti, arising in common with the latter, and passing down to become lost in the fibrous tissue at the back of the wrist. This, in Mr. Sutton's opinion, is probably the degenerate remains of the extensor annularis, which in process of shifting its origin from the condyle of the humerus to the ulna has become lost. This opinion is strengthened by the fact that the extensor minimi digiti does not arise by muscular fibres from the condyle, but takes its origin from the intermuscular septum between the extensor carpi ulnaris and the extensor communis digitorum, as though this muscle also was in process of descending from its condylar to some lower attachment.

The so-called ganglion on the posterior interosseous nerve is only a thickening of its perineurium.

PLATE XVI.

MUSCLES

<p>A Triceps.
 B Biceps.
 C Brachialis anticus.
 D Anconeus.
 E Supinator longus.
 F Extensor carpi radialis longior.
 G Extensor carpi radialis brevior.
 H Supinator brevis.
 I Extensor ossis metacarpi pollicis.
 K Extensor primi internodii pollicis.
 L Extensor secundi internodii pollicis.
 M Extensor indicis.</p> | <p>N Extensor medius.
 O Cut origins of the extensor minimi digiti and communis digitorum.
 P Cut origin of extensor carpi ulnaris.
 P' Tendon of extensor carpi ulnaris (insertion).
 R Insertion of pronator radii teres.
 S Dorsal interossei.
 T Adductor pollicis.
 V Abductor minimi digiti.
 X Posterior ligament of wrist.
 Y Flexor ossis metacarpi minimi digiti.</p> |
|---|---|

VESSELS

<p>a Posterior interosseous artery.
 b Recurrent branch of posterior interosseous, ascending under cover of anconeus.
 c Posterior terminal branch of superior profunda.
 d Radial artery.
 e Posterior carpal of radial.</p> | <p>f Metacarpal of radial coming off, as it often does, in common with the posterior carpal.
 g Posterior carpal of ulnar.
 h Dorsalis indicis.
 i Metacarpal arteries from posterior carpal arch.
 k Posterior branches of anterior interosseous artery.</p> |
|---|---|
- l Radial recurrent.

NERVES

<p>1 Posterior interosseous.
 2 Its muscular branches to the extensores carpi ulnaris, communis digitorum, and minimi digiti.
 3 Terminal branch, with slight enlargement (pseudo-ganglion) on it at wrist.
 4 Its branch to extensor ossis metacarpi pollicis.
 5 Its branch to extensor primi internodii pollicis.
 6 Its branch to extensor secundi internodii pollicis.</p> | <p>7 Its branch to the extensores indicis and medius.
 8 Musculo-spiral.
 9 Its branch to supinator longus.
 10 Its branch to extensor carpi radialis longior.¹
 11 Its branch to brachialis anticus.
 12 Branch to extensor carpi radialis brevior.²
 13 Radial nerve.
 14 Branch of posterior interosseous to supinator brevis.</p> |
|---|---|

¹ The branch from the musculo-spiral to (F) the extensor carpi radialis longior in the small sketch has been numbered 9 instead of 10.

² The branch to the extensor carpi radialis brevior usually comes off from the posterior interosseous, but here it came off from the musculo-spiral, and ran down loosely attached to the radial nerve from which it appears in the plate to take its origin.

PLATE XVII.

THE DORSUM OF THE HAND.

This dissection shows the structures on the dorsum of the hand.

In order to show more clearly the nerve-supply on the back of the hand and fingers, the following diagram has been introduced:—(*e*) dorsal branch of ulnar; (*f*) radial nerve; (*g*) twigs from the digital branches of the median supplying the dorsal aspect of the phalanges; (*h*) twigs from the palmar digital branches of the ulnar which supply chiefly the lateral aspects of the little and half the ring finger. Those twigs on the ulnar side of the little finger could not be shown for want of space.

The six different compartments of the posterior annular ligament are, starting from the radial side:—

- I. For the extensor ossis metacarpi and primi internodii pollicis.
- II. For the extensor carpi radialis longior and brevior.
- III. For the extensor secundi internodii pollicis.
- IV. For the extensor communis digitorum and extensor indicis.
- V. For the extensor minimi digiti.
- VI. For the extensor carpi ulnaris.

The synovial sheath of the extensor secundi communicates with that of the extensores carpi radiales as they cross each other.

PLATE XVII.

MUSCLES

<p>A Extensor communis digitorum.
 B Extensor minimi digiti.
 C Extensor carpi ulnaris.
 D Extensor ossis metacarpi pollicis.
 E Extensor primi internodii pollicis.
 F Extensor secundi internodii pollicis.
 G Extensor indicis.
 H Extensor carpi radialis brevior.
 I Extensor carpi radialis longior.
 K Dorsal interossei; the first is sometimes called the abductor indicis.</p> | <p>L Adductor pollicis, sending an expansion on to the extensor secundi internodii pollicis.
 M Posterior annular ligament; the six different compartments are indicated by numerals.
 N Expansion from the interossei to the extensor tendons (on the radial side it is also joined by the expansion from the lumbricales).
 O Abductor minimi digiti.
 P Flexor ossis metacarpi minimi digiti.</p> |
|--|--|
- V Vinculae.

VESSELS

<p>a Radial artery.
 b Dorsales pollicis.
 c Dorsalis indicis.
 d Metacarpal.
 e Posterior carpal of radial.</p> | <p>f Metacarpal arteries from posterior carpal arch
 g Posterior terminal branch of anterior interosseous.
 h Radialis indicis.</p> |
|--|---|
- i Terminal branch of posterior interosseous.

NERVES

1 Radial.	2 Dorsal branch of ulnar.

The common extensor tendon for the little finger runs down parallel to that of the ring, and only branches away from it towards the lower part of the interosseous space, then joining the radial of the two tendons, into which the extensor minimi digiti divides.

PLATE XVIII.

THE SUPERFICIAL VIEW OF THE FRONT OF THIGH, FASCIA LATA, AND SAPHENOUS OPENING.

In this dissection the superficial fascia and the cribriform fascia have been entirely removed in order to show the saphenous opening in the fascia lata. The cutaneous nerve supply to the front of the thigh is shown in the annexed diagram: (a) external cutaneous branch [2 and 3 L]; (b) the gluteal branch of the external cutaneous passing backwards; (c) middle cutaneous branch of the anterior crural; (d) crural branch of the genito-crural [1 and 2 L]; (e) ilio-inguinal nerve [1 L]; (f) small upper cutaneous twigs from the internal cutaneous; (g) internal cutaneous piercing fascia lata in two branches; (h) patellar branch of the long saphenous; (k) long saphenous. The position of Poupart's ligament is indicated by a thick dotted line.

The saphenous opening is an oval opening in the fascia lata formed by the difference in level of the outer or iliac and the inner or pubic portions. The iliac portion is attached to the whole length of Poupart's ligament as far as the pubic spine; from this point its inner edge curves outwards and downwards superficial to the femoral vessels, exposing the inner part of their sheath, forming a sickle-like edge—the falciform edge of the saphenous opening; it then passes under the long saphenous vein to join the inner or pectineal portion. The pectineal portion of the fascia lata passes over the pectineus muscle, being attached above to the ilio-pectineal line and Gimbernat's ligament; and, passing *behind* the sheath of the femoral vessels, with which it is blended, is continued into the fascia covering the psoas muscle.

The superficial or iliac portion of the fascia lata, although attached to the front of the sheath of the femoral vessels, can easily be separated by using the handle of the scalpel.

Thus the saphenous opening is bounded externally and in front by the falciform edge of the iliac portion of the fascia lata, and internally and behind by the pectineal portion. Stretching across from one side to the other is a thin plane of areolar tissue which is perforated by the various vessels, and hence has been called the cribriform fascia; it is a most indefinite structure, which is attached to the falciform process externally, and joins the superficial fascia internally, and until it is cleared away the falciform edge cannot be well seen. This opening is important surgically on account of its allowing a femoral hernia to exit when it becomes complete: it gives passage to the lymphatics entering the crural canal to join the deep inguinal glands, the superficial veins, and pudic and epigastric arteries.

PLATE XVIII.

MUSCLES AND FASCIA

<p>A The pectineal portion of the fascia lata.
The letter is placed over the pectineus muscle.</p> <p>A' This letter is placed over the adductor brevis.</p> <p>B The iliac portion of the fascia lata.
The letter is placed over the sartorius muscle.</p> <p>C The falciform edge or process of the fascia lata.</p>	D This inward prolongation of the falciform edge is known as Hey's ligament. E Femoral sheath. F Poupart's ligament. G Lymphatic glands (femoral set). H The cord. T Lymphatic glands (inguinal set). I External oblique.

VESSELS

a Saphenous vein. b Placed on sheath of vessels over femoral vein. c Accessory saphenous vein. d Superficial external pudic vessels.	e Superficial epigastric artery. f Superficial epigastric vein. g Superficial circumflex iliac artery. h Superficial circumflex iliac vein. i Saphenous branch of femoral artery.

NERVES

1 Ilio-inguinal. 2 Crural branch of genito-crural. 3 Middle cutaneous.	4 External cutaneous. 5 Twigs from the internal cutaneous piercing the fascia lata.

Lymphatic Glands.—These are usually divided into two sets, the *inguinal*, placed along the line of Poupart's ligament, and the *femoral*, placed along the saphenous vein. The femoral glands receive the lymph from the dorsum of the foot, the inner side, and front of the legs and thigh. The inguinal may be subdivided into three groups, an inner, which receives the lymph from the skin of penis, scrotum or labia, anus, and ischio-rectal fossa; a middle, which receives the lymph from the lower part of the front of the abdomen; and an external, which receives the lymph from the buttock and flank.

The femoral sheath is a funnel-shaped structure, which is derived from the transversalis fascia in front and the iliac fascia behind as the artery passes under Poupart's ligament; it is divided into three compartments by means of fibrous septa, an outer one for the femoral artery, a middle for the femoral vein, and an inner one, which is very short, containing the lymphatics which pass from the glands in the groin to the deep inguinal lymphatic glands. It is called the crural canal, and through it a femoral hernia passes when present. This canal is bounded above by Poupart's ligament; below by the pectineus muscle covered by the pectineal portion of the fascia lata, and the ramus of the pubes; internally by Gimbernat's ligament; and externally by the middle compartment of the femoral sheath containing the femoral vein. A hernia passing down the canal is thus covered by (1) peritoneum; (2) septum crurale, which is continuous with the subperitoneal tissue; (3) fascia transversalis; (4) cribriform fascia; (5) superficial fascia and skin.

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PLATE XIX.

SCARPA'S TRIANGLE.

This plate shows a superficial dissection of the front of the thigh, the fascia lata and the sheath of the femoral vessels having been removed. If the line of Poupart's ligament be compared with that in Plate XVIII., it will be noticed that the ligament is bowed down towards the thigh when the fascia lata is intact; but when this is removed the line of the ligament becomes nearly straight, retracting sufficiently to allow the origin of the deep epigastric or circumflex iliac from the external iliac artery to be seen.

Scarpa's Triangle.—This triangle is situated in the front of the thigh, with the base upwards and apex downwards. Its boundaries are:—

Base : Poupart's ligament.

Inside : Inner edge of the adductor longus.

Outside : Inner edge of the sartorius.

Floor is formed from within outwards by the adductor longus, pectineus, psoas, and iliacus muscles. Sometimes the adductor brevis is seen between the adductor longus and pectineus: this chiefly occurs in thin and weak subjects.

Contents : It contains the common, superficial, and deep femoral arteries and veins and their branches; the anterior crural nerve with its branches; the crural branch of the genito-crural nerve and the external cutaneous nerve.

The nerve to the sartorius is usually bound up with the middle cutaneous nerve, but it may occasionally run with the internal cutaneous. In the dissection represented the nerve came off direct from the anterior crural above Poupart's ligament. The genito-crural nerve is not uncommonly united with the middle cutaneous branch of the anterior crural before piercing the fascia. (Macalister.)

PLATE XIX.

MUSCLES

A Sartorius.	H Tensor vaginæ femoris.
B Iliacus.	K Cut edge of fascia lata.
C Pectineus.	L Placed on the external spermatic or
D Adductor longus.	intercolumnar fascia which covers
E Gracilis.	the cord.
F Vastus internus.	M Poupart's ligament.
G Rectus femoris.	N Anterior superior spine of ilium.

VESSELS

a Common femoral artery.	g Superficial external pudic.
b Common femoral vein.	h Deep external pudic.
c Long saphenous vein.	i External circumflex.
d Superficial epigastric artery.	k Muscular branch from profunda femo-
e Superficial epigastric vein.	ris.
f Superficial circumflex iliac artery.	l Deep circumflex iliac artery.

NERVES

1 External cutaneous.	7 Long saphenous.
2 An accessory branch coming from ex-	8 Nerve to pectineus.
ternal cutaneous.	9, 10 Deep muscular branches of anterior
3 Anterior crural trunk.	crural.
4 Middle cutaneous from anterior crural.	11 Crural branch of the genito-crural.
5 Internal cutaneous.	12 Ilio-inguinal.
6 Muscular branch to sartorius.	

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PLATE XX.

THE FRONT OF THIGH WITH THE SARTORIUS CUT.

In this dissection the sartorius has been cut through and removed, as well as the fibrous tissue which forms the covering of Hunter's canal, exposing the femoral artery and long saphenous nerve.

Hunter's Canal.—After the femoral artery leaves Scarpa's triangle and gets under the cover of the sartorius it lies in a groove between the vastus internus externally and the adductor longus and magnus internally and behind. Here it is covered over by a layer of fibrous tissue, which stretches across from the adductor to the vastus; thus it lies in a musculo-aponeurotic canal, called Hunter's canal, which extends from near the apex of Scarpa's triangle to the opening under adductor magnus. The canal contains the femoral artery and vein and the long saphenous nerve; the latter may occasionally run in the fibrous tissue forming the roof.

The plate also shows well the relation of the long saphenous nerve to the nerve to the vastus internus.

The nerve (11), which is a branch of the superficial division of the obturator, should be carefully traced down from its exit between the adductor longus and magnus; it will be found to send a small twig to the femoral artery and then to pass on, communicating near the edge of the sartorius with a branch from the internal cutaneous and one from the long saphenous, thus forming an intercommunication, which has been called the obturator plexus (subsartorial), and from which branches are distributed to the skin on the inner side of the knee and hamstrings. It is important clinically to remember this in connection with hip-joint disease, for one of the early signs commonly present is pain over the inner side of the knee-joint, and it must be remembered that the same division of the obturator sends a branch to the hip-joint, and this being irritated the pain is referred to the skin supplied by its cutaneous branch.

PLATE XX.

MUSCLES

A Sartorius. ✓	G Rectus. ✓
B Iliacus. ✓	H Tensor vaginæ femoris.
C Pectineus.	I Spermatic cord.
D Adductor longus. ✓	K Edge of the fascia lata ensheathing
E Gracilis. ✓	the tensor vaginæ femoris.
F Vastus internus. ✓	

VESSELS

a Common femoral artery.	h Transverse branches from the same.
b Common femoral vein.	i Descending branches of the same.
c Superficial femoral artery.	k Muscular branch from deep femoral
d Superficial femoral vein.	to adductors.
e Profunda femoris artery.	l Deep external pudic artery.
f External circumflex.	m Muscular branch.
g Ascending branch of external circumflex.	

NERVES

1 External cutaneous.	9 Nerves to rectus.
2 Ilio-inguinal.	10 Nerves to crureus and vastus externus.
3 Anterior crural.	11 Branch from the superficial division
4 Middle cutaneous.	of the obturator, which carries a
5 Nerve to pectineus.	vasomotor branch to femoral artery,
6 Internal cutaneous.	and joins in the so-called obturator
7 Long or internal saphenous.	or subsartorial plexus.
8 Nerve to vastus internus.	

PLATE XXI.

DEEP VIEW OF THE FRONT OF THE THIGH.

In this plate a dissection of the deeper parts of Scarpa's triangle and front of thigh is shown. The adductor longus has been cut and the middle part removed; the pectineus has also been divided and the ends turned back, exposing the obturator externus and its fascia and the obturator nerve. The rectus muscle has also been divided: this muscle has two heads of origin from the ilium, a straight head arising from the inferior spinous process and a reflected head arising just above the acetabulum: the latter is the original head of origin in early foetal life, the straight head being a later development, appearing about the third month as a thickening in its sheath. This double origin allows the muscle to act forcibly as an extensor in the different positions of the limb, for in the extended position the straight head will give the *point d'appui*, while the reflected will act best in the flexed position of the limb. Professor Cleland states that the presence of the straight head of the rectus probably saves that muscle at least half an inch more contractile muscular substance, and is thus an economy to the body. The deep prolongation of the fascia lata beneath the tensor vaginæ femoris is also well shown: it is usually a well-marked and powerful band, and is attached above to the ilium, just below the origin of the tensor. The profunda femoris is usually described as having four perforating branches, one given off above the level of the adductor brevis and piercing the magnus to get to the back of the leg, another piercing both these muscles, and two given off below the level of the brevis and piercing the magnus alone. Very often, however, the first and second are conjoined, and pierce the brevis and magnus; sometimes there are two branches, and then it is usually the rule for them both to pierce the brevis as well as the magnus.

Nerve Supply of Pectineus.—The pectineus of man is usually considered to be a dorsal muscle, and as such would be supplied by a dorsal nerve—the anterior crural. In about 8 per cent. of cases it also gets a branch from the obturator; when this happens it is probably because the muscle then consists of two separate elements: a dorsal one supplied by the anterior crural, a dorsal nerve, and the other a ventral by the obturator, a ventral nerve. In the horse it consists of two layers, a superficial, supplied by the anterior crural and resembling the pectineus of man, and a deep layer supplied by the obturator and seeming to belong to the adductors, the two being separated by the pubo-femoral ligament. In reptiles this double nerve supply is frequently seen. The muscle is occasionally divided into two parts in man. The accessory obturator nerve which sometimes supplies it would be better named accessory anterior crural, because (1) its origin is more closely allied to the anterior crural than obturator; (2) if it runs with obturator it courses over the pubic ramus; (3) it supplies a portion of the pectineus in place of the anterior crural.¹

Mr. Sutton² thinks that the ligamentum teres of the hip-joint is the lost tendon of the pectineus muscle, for he finds that (1) in the lizard (*Sphenodon*) the tendon of the ambiens (pectineus) passes inside the capsule to the head of the femur; (2) in the ostrich (*Struthio Camelus*) the ligament is continuous with the ambiens across the cotyloid cavity by means of fibrous tissue; (3) in the horse (*Equus*) the ligamentum teres is in two parts, one being hidden within the joint, the cotyloid portion, and one being attached to the pubes, the pubo-femoral portion—from this band the pectineus partly arises; (4) in man the ligamentum teres is a fibrous band carrying blood vessels to the head of the femur.

¹ Dr. Patterson, *Journ. of Anat. and Phys.* vol. xxvi.

² Sutton, *Ligaments—Nature and Morphology*, p. 69.

PLATE XXI.

MUSCLES

<p>A Sartorius. ✓
 B Iliacus. ✓
 C Psoas. ✓
 D Pectineus origin.
 D' Pectineus insertion.
 E Adductor longus origin. ✓
 E' Adductor longus insertion. ✓
 F Adductor brevis. ✓
 G Adductor magnus. ✓
 H Gracilis. ✓
 I Obturator externus.
 K Rectus origin, showing its two heads.
 K' Rectus. ✓</p> | <p>L Tensor vaginæ femoris.
 M Anterior border of gluteus minimus.
 N Fascia lata enclosing tensor vaginæ femoris.
 O Crureus.
 P Vastus externus. ✓
 Q Vastus internus. ✓
 R Placed on pubo-femoral band of capsule of hip-joint.
 S Fascia covering the obturator externus.
 T Placed on horizontal ramus of pubes.
 V Placed on small trochanter at point of insertion of psoas.</p> |
|--|---|

VESSELS

<p>a Common femoral artery.
 b Common femoral vein.
 c Superficial femoral artery.
 d Deep femoral artery.
 e External circumflex.
 f Ascending branch of external circumflex.
 g Transverse branch of external circumflex.
 h Descending branch of external circumflex.
 h' Continuation of the last going down to enter the anastomosis in front of knee-joint.
 i Internal circumflex.</p> | <p>k Ascending branch of internal circumflex.
 l Descending branch of internal circumflex.
 m Continuation of internal circumflex which joins the so-called crucial anastomosis.
 n Branch which ascends in front of quadratus femoris to gain digital fossa and anastomose with gluteal and sciatic.
 o Obturator artery.
 p Muscular branches.
 r Second perforating artery—no true first perforating in this body.
 s Third perforating artery.</p> |
|---|--|

NERVES

<p>1 Anterior crural.
 2 Branch of anterior crural to pectineus.
 3 Internal cutaneous of anterior crural.
 4 Middle cutaneous of anterior crural.
 5 Nerve to vastus internus.
 6 Internal or long saphenous.
 7 Nerve to rectus.
 8 Nerve to vastus externus.
 9 Twig from the last which accompanies h' and reaches the knee-joint.
 10 Nerve to crureus, also sending a twig to the vastus internus.
 11 Superficial division of obturator.
 12 Branch of superficial division which</p> | <p>supplies the adductor longus; carries with it (16) the twig to the obturator plexus.
 13 Branch of obturator to adductor brevis.
 14 Branch of obturator to gracilis.
 15 Deep division of obturator.
 16 Branch of superficial division of obturator which joins obturator or subsartorial plexus, and is distributed to skin, also giving a vasomotor twig to femoral artery.
 17 Branch of long saphenous which joins the obturator plexus.
 18 Ilio-inguinal nerve.</p> |
|--|--|

PLATE XXII.

THE INNER SIDE OF THE KNEE AND POPLITEAL SPACE, &c.

This plate shows a dissection to expose the popliteal space from the inner side, and also exposing the insertion of the gracilis, sartorius, and semitendinosus. A window has been cut in Hunter's canal to show the femoral artery, and also the long saphenous nerve.

The origin of the lower fibres of the vastus internus from the tendinous insertion of the adductor magnus is well seen. While dissecting this region compare the difference in level between the origin of the muscular fibres of the quadriceps extensor on the inside and outside, and it will be found that the inner ones arise from the insertion of the adductor magnus nearly down to the condyle, while the external cease much higher up; thus the external are inserted more obliquely than the internal. Bearing in mind that the patella rests more on the outer condyle of the femur than the inner, is not this lower origin of the inner portion of the quadriceps to act as a brace on the patella and counteract the tendency for it to slip still further outwards?

The close connection of the insertion of the adductor magnus into the internal condyle, and the origin of the internal lateral ligament just below it, suggests that these two structures might be related, and in a human fœtus of the fourth month the adductor magnus will be observed to be inserted into the head of the tibia, while in the young orang it is directly continuous with the ligament, so that there are reasons for considering this ligament as a divorced part of the adductor magnus.¹

The wide aponeurotic insertion of the sartorius is well known, and in dissecting it the lower part sends a strongish slip into the fascia of the leg, the fibres of which can be traced down nearly as far as the ankle: this may possibly be adduced as the reason why the long saphenous nerve has such an extensive skin supply, reaching as far as the ball of the great toe, thus following the law, that a nerve supplying a muscle supplies also the skin over the area of its muscular action. A similar instance occurs in the arm where the biceps is inserted through the bicipital fascia into the fascia of the arm: it is supplied by the musculo-cutaneous nerve, which also supplies the skin over the fascia acted on by the biceps as far down as the wrist.

¹ Mr. Bland Sutton, *Ligaments—Nature and Morphology*.

PLATE XXII.

MUSCLES

- A Vastus internus. ✓
- B Rectus. ✓
- C Sartorius. ✓
- C' Its aponeurotic insertion into the inner surface of the tibia.
- D Adductor magnus. ✓
- D' Tendon of adductor magnus passing to its insertion at the adductor tubercle, O.

- E Gracilis. ✓
- F Semimembranosus. ✓
- F' Tendon of insertion of the semimembranosus passing to groove on the inner side of tuberosity of tibia. ✓
- G Tendon of semitendinosus. ✓
- H Biceps. ✓
- K Gastrocnemius—inner head of origin.

- L Placed on the fibrous tissue at the lower end of Hunter's canal.
- M Internal lateral ligament of knee.
- N Placed on the patella.
- O Placed on the adductor tubercle.
- P The back portion of the internal condyle of the femur.
- S Tubercle of the tibia.

VESSELS

- a Femoral artery in Hunter's canal.
- b Popliteal artery.
- c Popliteal vein.
- d External or short saphenous vein.
- e The superficial branch of the anastomotica magna.

- f Superior internal articular artery.
- g Superficial branch of the superior internal articular artery.
- h Superior external articular artery.
- i Upper muscular branches of the popliteal artery.

- k An arterial branch which passes down with the short saphenous vein.
- l Long saphenous vein.

NERVES

- 1 Internal popliteal.
- 2 Long saphenous in Hunter's canal.
- 2' Long saphenous after its exit from the lower end of canal.
- 3 Patellar branch of long saphenous.

- 4 A branch given off from the long saphenous which runs down to the patellar plexus.
- 5 Internal cutaneous.

- 6 Nerve to vastus internus from the anterior crural, sending a branch on to the knee-joint.
- 7 Communicans poplitei or tibialis.

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PLATE XXIII.

THE FRONT OF THE LEG AND ANTERIOR TIBIAL ARTERY.

Two dissections are represented in this plate, a superficial one showing the extensor and peronei muscles *in situ*, and a second in which the extensors have been separated from the tibialis anticus, and pulled out to expose the anterior tibial artery and nerve. The peroneus longus has also been cut into, showing the course through it of the anterior tibial and musculo-cutaneous nerves.

The intermuscular septum between the peronei and extensor muscles can often be observed as a whitish line in the deep fascia of the leg: this is a point to be avoided in ligaturing the anterior tibial artery in its upper third: there is *no such white line* between the tibialis anticus and extensor longus digitorum, and the division of these two muscles is often hard to determine owing to the fact that both arise from the fascia of the leg, and that the upper part of the extensor tends to overlies somewhat the tibialis anticus. The division between these two muscles is about half an inch inside the septum between the peronei and extensors.

The skin supply of the front of the leg and dorsum of the foot is shown in the accompanying diagram:—(a) Long or internal saphenous, (b) cutaneous twigs from the external popliteal, (c) the two branches of the musculo-cutaneous usually piercing the fascia separately, (e) external or short saphenous, (f) anterior tibial.

The nerve supply to the dorsum of the foot varies somewhat, but by far the most common arrangement is that shown in the diagram. Sometimes, however, the external saphenous supplies a branch to the inner side of the little and outer side of the fourth, replacing a branch of the musculo-cutaneous, and thus supplying one and a half toes. Occasionally in the same way, but more frequently, it may replace the two outer branches of the musculo-cutaneous, and thus supply two and a half toes.

The peroneus tertius is not met with except in man, and is a specialised slip of the extensor longus digitorum, whose use is to raise the outer border of the foot in walking. (Macalister.)

PLATE XXIII.

MUSCLES

<p>A Tibialis anticus.
 B Extensor longus digitorum.
 C Extensor proprius hallucis.
 D Peroneus tertius.
 E Peroneus longus.
 E' Tendon of peroneus longus.
 F Peroneus brevis.
 F' Tendon of peroneus brevis.
 G Vertical portion of the annular ligament.
 H Horizontal portion of the annular ligament.</p> | <p>I External malleolus.
 K Tubercle of the tibia.
 L Internal subcutaneous surface of the tibia.
 M Placed over the intermuscular septum between the extensor muscles and the peronei, which usually shows as a <i>whitish line</i>.
 N Placed on the insertion of the sartorius into the tibia.
 O Interosseous membrane.
 P The external surface of the tibia.</p> |
|--|---|

VESSELS

<p>a Anterior tibial artery.
 b Anterior recurrent branch of the anterior tibial artery.
 c Muscular branches of the anterior tibial.
 d Anterior division of the peroneal artery.</p> | <p>e External malleolar branch of the anterior tibial.
 f Internal or long saphenous vein.
 g A communicating vein between the long saphenous and the short saphenous.</p> |
|--|--|

NERVES

<p>1 External popliteal.
 2 Anterior tibial.
 3 Musculo-cutaneous.
 4 Branches from anterior tibial to the tibialis anticus, one of which turns up to accompany the recurrent articular artery.
 5 Branches from anterior tibial piercing the peroneus longus to reach the upper part of the extensor longus digitorum.
 6 Branches from the musculo-cutaneous to supply peroneus longus.</p> | <p>7 Branches from the musculo-cutaneous to supply peroneus brevis.
 8 Cutaneous branch of musculo-cutaneous.¹
 9 Branches of anterior tibial to the extensor longus digitorum.
 10 Branch of the anterior tibial to peroneus tertius.
 11 Branches of the anterior tibial to extensor proprius hallucis.
 12 Branches of anterior tibial to tibialis anticus.
 13 Internal saphenous.</p> |
|---|---|

¹ This nerve usually pierces the fascia in two branches instead of one as in this dissection.

PLATE XXIV.

THE DORSUM OF THE FOOT.

The anterior annular ligament is divisible into two portions, an upper *vertical*, which stretches across from the tibia to the fibula, and is merely a thickening in the deep fascia; and a lower or *horizontal*, which starts from the anterior rough upper surface of the os calcis, and, passing as a strong band over the tendons of the extensor longus digitorum and peroneus tertius, sends a strong slip behind them to reach the starting-point at the os calcis: *thus these tendons are enclosed in a pulley-like band*. The rest of the ligament is not so clearly defined, and consists of two parts, one of which passes up over the extensor longus hallucis and then splits to enclose the tendon of the tibialis anticus before its insertion into the tibia, while the other passes over both the extensor longus hallucis and tibialis anticus to lose itself in the fascia over the inner side of the foot. The pulley-like portion of the ligament is the only part of the lower band which is repeated in most animals, and plays the same part there as in man.

The *extensor brevis digitorum* is an interesting example of a migrating muscle, shifting its attachment. This has been traced by Dr. Ruge.¹ In monotremes the muscle arises entirely from the fibula, the belly for the tendon to the fifth toe being easily separable from the rest, and having a higher attachment to the bone. In thylacine marsupials the whole muscle arises from the fibula, the tendons passing behind the external malleolus, whereas in *Didelphys cancrivora* the belly for the great toe has descended to take a pedal attachment from the os calcis, giving a small muscular slip to the short extensor tendon of the second toe, which has its chief origin with the third and fourth from the fibula, the fifth still being highest in origin and separated from the rest. In cuscus and koala two bellies are pedal (2 and 3), and two fibular in origin—the fourth and fifth—which still pass behind the malleolus to reach the foot. In carnivora both the lion and the cat have three muscular bellies pedal in attachment springing from the os calcis and annular ligament of the long extensor, the inner belly again splitting, while the fifth still arises from a muscular belly high up on the fibula, and passes behind the external malleolus to its insertion. In the monkeys, *Ateles* and *Macacus rhæsus*, the fifth tendon is still arising from the fibula and passing down behind the external malleolus in close proximity to the peroneus brevis, while the rest of the muscle is pedal. In man there is a pedal extensor brevis sending tendons to the four inner toes, there being no extensor (as such) to the fifth, but the peroneus brevis always sends forwards a slip to join the extensor longus of the fifth digit, which it joins on its outer side: this is probably the fifth tendon of the extensor brevis which in migrating has lost its muscular mass, and whose sole remains is the tendinous slip blended with the peroneus brevis; it also throws light upon that muscular anomaly known as the peroneus quinti digiti, which is probably a retrogression to the original condition. Dr. Ruge considers that the outgrowth of the external malleolus in monkeys and man stops the further distal migration of this muscle, which either perishes, as in the orang, or the belly of its muscle becomes partially adherent with the peroneus brevis (as in *cebus*), or wholly adherent, as in the chimpanzee, gorilla, and man.

¹ *Morph. Jahrbuch*, 1878, p. 592.

PLATE XXIV.

MUSCLES

<p>A Tibialis anticus.
 B Extensor proprius hallucis.
 C Extensor longus digitorum.
 D Peroneus tertius.
 E Extensor brevis digitorum.
 E' Tendons of the extensor brevis.
 F Peroneus brevis.
 G Peroneus longus.
 H Slip from the tendon of the peroneus brevis to the little toe (peroneus quinti digiti).
 K Dorsal interossei.
 L Expansion from the interossei and</p> | <p>lumbricales to join the extensor tendon.
 M Expansion from the tendon of the long flexor of the hallux into first phalanx.
 N Vertical portion of the anterior annular ligament.
 O Horizontal portion of the anterior annular ligament.
 P Tip of the external malleolus.
 R Part of external annular ligament enclosing peronei.
 S Anterior ligament of ankle joint.</p> |
|--|--|

VESSELS

<p><i>a</i> Anterior tibial artery.
 <i>b</i> Dorsalis pedis.
 <i>c</i> Tarsal branch of dorsalis pedis.
 <i>d</i> Metatarsal branch of dorsalis pedis.
 <i>e</i> Dorsalis hallucis.
 <i>f</i> Communicating artery to the deep plantar arch.
 <i>g</i> Interosseous branches from the meta-</p> | <p>tarsal which split into digital at web of fingers.
 <i>h</i> Anterior division of the peroneal.
 <i>k</i> External malleolar from the anterior tibial.
 <i>l</i> Internal saphenous.
 <i>m</i> Communicating with external saphenous.</p> |
|--|--|
- n* Communicating with the deep veins.

NERVES

<p>1 Musculo-cutaneous.
 2 Its internal branch.
 3 Its external branch.</p> | <p>4 Anterior tibial nerve, cutaneous or internal branch.
 5 External saphenous.</p> |
|---|--|

PLATE XXV.

THE BUTTOCK (GLUTEUS MAXIMUS).

This dissection is to show the gluteus maximus: the superficial layer of the fascia lata which covers it has been removed and cut short along the outer edge of the muscle. The cutaneous nerve supply of this region is indicated by the accompanying diagram: (a) Gluteal recurrent branch of the external cutaneous [2 and 3 L]. (a') Branches from the external cutaneous supplying the outer side of the thigh. (b) Lateral branch of the last dorsal nerve. (c) Iliac branch of the ilio-hypogastric. Both these two are derived from the *anterior* primary divisions of the spinal nerves. (d) External branches of the *posterior* primary divisions of the first and second lumbar nerves. (e) External branches of the posterior divisions of the sacral nerves. (f) Perforating cutaneous nerve from the third and fourth anterior divisions of the sacral nerves. (g) Gluteal branches of the small sciatic. (h, i) Internal and external cutaneous branches of the small sciatic to back of thigh. (k) Terminal branch of small sciatic which pierces the fascia at the upper part of the popliteal space, and supplies the skin as far as middle of calf. (l) Inferior pudendal or nerve of Sömmering. (m) Cutaneous branch of the obturator. (n) Posterior branch of the internal cutaneous.

The other side of the diagram shows Lizars's lines, which are the guides for finding the position of the gluteal and sciatic arteries at the point of their emergence from the pelvis. For the *gluteal*, bisect the line A B drawn between the tuber ischii and great trochanter at C, and draw a line from this point to the posterior superior spine of the ilium; trisect this line C E, and the upper point of trisection will be about the point at which the artery emerges. For the *sciatic* trisect the line A B and join the inner trisection with the posterior superior spine; this line bisected will indicate about the spot where it emerges from the pelvis.

Nor should Nélaton's line be forgotten, as it is important clinically: it is marked out by joining the anterior superior iliac spine with the anterior part of the tuber ischii; it just crosses the top of the great trochanter, and affords a ready means of recognising displacements from dislocations or fractures of the neck of the femur.

The fold of the buttock has nothing to do with the edge of the gluteus maximus; it is below the edge of the muscle at the inner part of the thigh, crossing it externally, and being best marked just below the ischial tuberosity. It is due to the relaxation of the skin in the erect position, and is lost when the thigh is flexed.¹

The subcutaneous tissue of this region in many of the negro races is an extremely thick layer, forming a regular pad or cushion.

The large size of the gluteus maximus is characteristic of man, its chief use being to extend the thigh, and thus maintain the body in the erect position; even in the anthropoid apes it is not nearly so well developed, and is less again in mammals. The part arising from the coccyx and sacrum may be separated, thus representing the *agitator caudæ* of animals.

It has the coarsest fascicles of any muscle in the body.

¹ Dr. Symington, *Journal of Anatomy and Physiology*, vol. xviii. p. 193.

PLATE XXV.

MUSCLES

<p>A Gluteus maximus. ✓
 B Cut edge of the superficial portion of fascia lata covering it.
 C Thick part of the fascia lata covering in the gluteus medius.
 D Placed on fascia lata where the anterior fibres of gluteus max. are inserted into it.
 E Adductor magnus. ✓
 F Semimembranosus. ✓
 G Semitendinosus. ✓</p> | <p>H Biceps. ✓
 I Vastus externus covered over by fascia lata into which some of the posterior fibres of the gluteus maximus are inserted.
 K Posterior superior spine of ilium.
 L Vertebral aponeurosis. Some fibres of the gluteus maximus usually pass over the crest of the ilium to take origin from this aponeurosis.</p> |
|---|--|

NERVES

<p>1 Gluteal recurrent from external cutaneous.
 2 Lateral branch of last dorsal.
 3 Iliac branch of the ilio-hypogastric nerve, first lumbar (anterior division).
 4 Branches of the posterior divisions of the first and second lumbar.</p> | <p>5 Branches from the posterior sacral nerves.
 6 Perforating cutaneous nerve from the fourth sacral or third and fourth.
 7 Gluteal recurrent branches from small sciatic.
 8 Small sciatic.</p> |
|---|--|
- 9 Internal and external cutaneous twigs from small sciatic.

PLATE XXVI.

THE BUTTOCK, GLUTEUS MEDIUS, &c.

In this dissection the gluteus maximus has been cut across its middle and the ends turned up and down, and the fibres arising from the great sacro-sciatic ligament have been partly detached in order to show more clearly the edge of the ligament.

The parts which are exposed by complete removal of the gluteus maximus are—

Bones.—Ilium, edge of sacrum and coccyx, tuber ischii, great trochanter, and gluteal ridge on the femur.

Ligaments.—Great and lesser sacro-sciatic.

Bursæ.—One over tuber ischii, one over great trochanter, and one between the tendon of the vastus externus and that part of the gluteus maximus which is inserted into the fascia lata.

Muscles.—Gluteus medius, pyriformis, obturator internus and the gemelli, tendon of the obturator externus, quadratus femoris, adductor magnus, biceps, semitendinosus, semimembranosus, vastus externus.

Vessels.—Gluteal, sciatic, with its coccygeal, muscular, anastomotic, comes nervi ischiadici, and terminal branches, pudic, internal circumflex, and first perforating.

Nerves.—Great and small sciatics, inferior gluteal, inferior pudendal, internal pudic, and the nerve to the obturator internus.

PLATE XXVI.

MUSCLES

A Gluteus maximus, origin.	L Semitendinosus.
A' Gluteus maximus, insertion.	M Vastus externus covered by fascia lata.
B Gluteus medius.	N Bursa between the vastus externus and anterior portion of gluteus maximus.
C Pyriformis.	O Placed on the tendinous origin of the vastus externus, the bursa having been opened.
D Superior gemellus.	P Great sacro sciatic ligament.
E Tendon of obturator internus.	R Tip of great trochanter.
F Inferior gemellus.	S Edge of fascia lata into which the posterior fibres of the gluteus are inserted.
G Tendon of obturator externus.	T Fascia lata covering the gluteus medius.
H Quadratus femoris.	V Placed on the posterior inferior spine of ileum.
I Upper portion of the adductor magnus, sometimes called the adductor quartus or minimus.	
J Adductor magnus.	
K Biceps.	

VESSELS

a Superficial branch of the gluteal artery.	h First perforating of the profunda femoris.
b Sciatic artery.	k Branch of internal circumflex which runs up to digital fossa to anastomose with sciatic and gluteal.
c Coccygeal branch of sciatic.	m Internal pudic.
d Anastomotic branch to digital fossa.	n Nutrient artery to the ileum from the gluteal.
e Branches to gluteus maximus.	
f Comes nervi ischiadici.	
g Terminal branch of sciatic.	

NERVES

1 Great sciatic.	5 Inferior gluteal.
2 Lesser sciatic.	6 Nerve to obturator internus.
3 Inferior pudendal branch of small sciatic.	7 Its branch to the superior gemellus.
4 Recurrent gluteal cutaneous branches.	8 Internal pudic.

PLATE XXVII.

THE BUTTOCK, GLUTEUS MINIMUS, &c.

In this dissection the gluteus maximus has been entirely removed from its origin from the sacro-sciatic ligament, &c., in order to show the plexiform arrangement of the posterior primary branches of the sacral nerves, which lie in the ligament covered over by its superficial fibres. The gluteus medius has also been divided and the ends turned aside in order to expose the minimus and the tensor vaginæ femoris, the gluteal nerve and deep part of the gluteal artery. Some little difficulty will be experienced in separating the anterior fibres of the medius from those of the minimus in front and below, owing to their being blended.

The superior and inferior gemelli are shown as one continuous muscular sheet lying under the obturator internus tendon, and arising from the edge of the cartilage-covered surface over which the tendon glides: this is the more usual condition in muscular subjects, but often the muscle substance is absent in the centre, and then the muscles have been rightly described as two—superior and inferior gemellus.

The dissector should also note that the tendon of the obturator lies on its *deep* surface next the bone, which is here grooved and covered by cartilage.

The accompanying diagram shows more clearly than a description the distribution and plexiform arrangement of the posterior primary divisions of the sacral nerves. As a rule, the three first external branches only become cutaneous, but the fourth may do so; the internal branches of the first three supply the multifidus spinæ. The fourth usually joins the fifth and the coccygeal to form a nerve twig, which is lost in the tissue at the back of the coccyx.

Note on the Crucial Anastomosis.—

At the back of the thigh in the neighbourhood of the quadratus femoris there is usually described a cruciform anastomosis, composed of the sciatic from above, the internal circumflex from in front, the first perforating from below and the external circumflex coming round below the trochanter through the fibres of the vastus externus; as thus described it is not often seen. There are generally two large anastomoses at the back of the thigh, one between the sciatic, gluteal, and internal circumflex in the digital fossa, and another usually just beneath the edge of the hamstrings formed of the sciatic first perforating and internal circumflex. The first perforating sends a branch through the gluteus maximus into the vastus externus, and this anastomoses with the external circumflex; but the latter does not usually come round to the back of the thigh.

PLATE XXVII.

MUSCLES

A Gluteus medius.	K Insertion of gluteus maximus.
A' Gluteus medius insertion.	L Biceps and semitendinosus cut and turned back.
B Gluteus minimus.	M Semimembranosus.
C Pyriformis.	N Vastus externus.
D Placed on the deep (tendinous) surface of the obturator internus.	O Pectineus.
D' Insertion of the obturator and gemelli, turned back.	P Psoas tendon.
E Superior gemellus.	S Tensor vaginæ femoris.
F Inferior gemellus.	T Great sacro-sciatic ligament.
G Obturator externus.	R Small trochanter.
H Quadratus femoris.	V Great trochanter (posterior superior angle).
I Adductor magnus.	Y Capsule of hip-joint.
J Part of adductor magnus, which is sometimes called adductor quartus or minimus.	Z Lesser sacro-sciatic ligament.

VESSELS

a Gluteal artery.	exiting between quadratus femoris and adductor magnus.
b Its superficial division.	k Ascending branch of internal circumflex running up in front of quadratus to digital fossa to anastomose with d and g.
c Its deep division.	l First perforating artery from the profunda femoris.
d Its anastomotic branch to digital fossa.	
e Sciatic artery.	
f Its coccygeal branch.	
g Its anastomotic branch to digital fossa.	
h Internal pudic.	
i Terminal branch of internal circumflex	

NERVES

1 Great sciatic.	11 Cutaneous branch from posterior primary division, second sacral.
2 Small sciatic.	12 Cutaneous branch from posterior primary division, third sacral.
3 Inferior gluteal.	13 Cutaneous branch from posterior primary division, fourth sacral.
4 Superior gluteal.	14 Fifth sacral.
4' Branch to the tensor vaginæ femoris.	15 Coccygeal.
5 Internal pudic.	16 Perforating cutaneous nerve from the anterior branch of the fourth, or third and fourth sacral.
6 Nerve to obturator internus and superior gemellus.	17 Branches from great sciatic to the hamstrings.
7 Nerve to quadratus femoris.	
8 Branch of 7 to the inferior gemellus.	
9 Branch of 7 to hip-joint.	
10 Cutaneous branch from posterior primary division, first sacral.	

Note.—The nerve to the tensor vaginæ femoris usually runs through the fibres of the gluteus minimus.

Highley. del

PLATE XXVIII.

THE SACRAL PLEXUS

In this plate the sacral plexus is shown exposed by removing parts of the ilium and sacrum by means of two saw-cuts—one from the top of the great sacro-sciatic notch obliquely upwards and inwards, and the other downwards along the edge of the sacrum, so planned as to avoid cutting into the sacral foramina. The pyriformis has been drawn out of the pelvis, and rests on the posterior surface of the ischium. The great sacro-

sciatic ligament has been cut and turned down, while the lesser sacro-sciatic ligament and the coccygeus muscle with which it is intimately connected are divided together.

The accompanying diagram shows a fairly usual arrangement of the sacral plexus; the parts shaded indicate the posterior branches, the light the anterior (as in the brachial plexus). The sacral plexus presents many varieties, and the above must only be regarded as a fairly normal arrangement.

PLATE XXVIII.

MUSCLES

<p>A Gluteus medius.
 B Gluteus minimus.
 C Piriformis.
 D Obturator internus.¹
 E Gemellus inferior.
 F Quadratus femoris.
 G Adductor magnus.
 H Gluteus maximus.
 I Vastus externus.
 K Great sacro-sciatic ligament cut and turned down.
 L Biceps and semitendinosus, origin from tuber ischii.</p> | <p>M Lesser sacro-sciatic ligament and coccygeus.
 N Spine of ischium.
 O Levator ani.
 P External sphincter.
 R Vertebral aponeurosis.
 S Tendon of obturator externus.
 V Placed over the sacro-coccygeal joint.
 W Section of sacrum.
 X Section of ilium.
 Y Tuber ischii.
 Z Great trochanter.</p> |
|---|---|

VESSELS

<p>a Gluteal artery.
 b Superficial division of the gluteal.
 c Deep division of the gluteal.
 d Sciatic artery.</p> | <p>e Internal pudic.
 f Anastomotic branch of internal circum-flex to the digital fossa.</p> |
|--|--|

NERVES

<p>1 Lumbo-sacral cord.
 2 First sacral.
 3 Second sacral.
 4 Third sacral.
 5 Fourth sacral.
 6 Fifth sacral.
 7 Coccygeal.
 8 Superior gluteal.
 9 Branch from second to piriformis.
 10 Inferior gluteal.
 11 Great sciatic.
 12 Small sciatic.
 13 Inferior pudendal.
 14 Recurrent gluteal branches of small sciatic.</p> | <p>15 Nerve to quadratus femoris, inferior gemellus, and hip-joint.
 16 Nerve to obturator internus and superior gemellus.
 17 Internal pudic.
 18 Perforating cutaneous nerve (n. perforans cutaneus).
 19) Visceral branches of third and fourth
 20) sacral.
 21 Nerve to coccygeus.
 22 Nerve to sphincter.
 23 Nerve to levator ani.
 24 Nerve formed by the junction of fourth and fifth sacral and coccygeal, distributed to skin (ano-caudal).</p> |
|--|--|

In some cases it will be found that the small sacro-sciatic ligament is entirely or partly replaced by fibres of the coccygeus muscle, of which it appears to be a fibrous retrogression ; in the armadillo this is again replaced by bone.

¹ The muscle substance was very thin in this body, and there was complete absence of the gemellus superior.

PLATE XXIX.

THE BACK OF THE THIGH, HAMSTRINGS, AND SMALL SCIATIC NERVE.

The dissection of the back of the thigh shows the small sciatic and hamstrings. It is a little less than two-thirds natural size. The gluteus maximus has been drawn slightly upwards in order to expose the origin of the hamstrings from the tuber ischii.

When the origin of the biceps from the tuberosity is examined, it will be noticed that a large number of the tendinous fibres of origin are continuous with those of the great sacro-sciatic ligament. In ruminants this ligament is replaced by a thick strong tendon, and it may be taken that the ligament is mainly the continuation of the tendon to a higher origin, which has been cut off by the outgrowth of the tuber ischii. In some of the marsupials the biceps has two origins—a tendinous origin from the tuber with the semitendinosus and another muscular slip which springs from the second and third caudal vertebræ under cover of the *agitator caudæ* (posterior part of gluteus maximus), and passes down superficial to, and a little to the outer edge of, the tuber, and then joins the main mass of the muscle at its insertion. The use of the second origin is to associate the movements of the hind limb with a heavy tail.

The hamstrings are good examples of long muscles passing over more than one joint acting on both, and so tending to co-ordinate their movements, and enabling them to be produced with the least expenditure of power. They are also too short to allow complete flexion of the hip when the knee is extended: this may be tested by noticing the strain required to touch the toes with the fingers when the knee is straight; again the gastrocnemius is too short to allow complete flexion of the ankle when the knee is extended; also the flexors of the fingers are too short to permit full extension of the fingers when the wrist is over-extended. If the muscles be measured in these different positions, the length will not be found to alter, the varying positions of the joints being due to a slight advance of one and retreat of the other; hence, in walking, the rectus, gastrocnemius, and hamstrings are not alternately contracted and stretched, but remain equal in length, the advance of one joint compensating for the retreat of the other. Replace these muscles by ligaments and see what would occur. Suppose the thigh bent by the ilio-psoas; the hamstrings *ligament* would at once flex the knee, being too short to allow its remaining extended. Now suppose the limb bent at the ankle by the weight of the body producing flexion; the gastrocnemius *ligament* would at once slightly flex the knee, and this would also tend to bring the centre of gravity back to a more stable condition. Thus muscles passing over more than one joint partake of the nature of elastic ligaments; but being built up of contractile substance, if this contracts at the same time they would act far more effectually than ligaments could do; and when acting in this fashion as ligaments they are combiners and diffusers, not producers of the movement, the short muscles producing and the long diffusing it: thus they give the short muscles 'an indirect action on the joints over which they *do not* pass,' and so increasing their range of action. Being also elastic, they give when taxed beyond their strength, instead of rupturing as ligaments would do.¹

¹ Professor Cleland, *Journal of Anat. and Phys.* vol. i. p. 85.

PLATE XXIX.

MUSCLES

A Gluteus maximus.	G Sartorius.
B Semitendinosus.	H Vastus externus covered by fascia.
C Biceps long head.	I Gastrocnemius.
D Semimembranosus.	K Pantaris.
E Adductor magnus.	L Tuber ischii.
F Gracilis.	

VESSELS

a Popliteal artery.	e Long or internal saphenous.
b Popliteal vein.	(An accessory vein from the external
c External or short saphenous vein.	saphenous communicates with the
d An arterial twig accompanying the	veins of perforating arteries.)
short saphenous vein.	

NERVES

1 Small sciatic.	8 Communicans peronei to join the
2 External branches.	external saphenous.
3 Internal branches.	9 Cutaneous branch to skin of outer
4 Gluteal recurrent twigs to buttock.	side of leg from external popliteal.
5 Inferior pudendal.	10 Lower division of internal cutaneous
6 Internal popliteal.	from anterior crural supplying skin
7 External popliteal.	over inner side of leg, and pos-
	teriorly.

PLATE XXX.

THE DEEP PARTS OF THE BACK OF THE THIGH, ADDUCTOR MAGNUS, GREAT SCIATIC, &c.

In this dissection the hamstring muscles have been cut away from their origin from the tuber ischii and removed to show the adductor magnus, great sciatic nerve, and the deep portion of the popliteal space.

The adductor magnus may usually be divided into two parts :—

1. A posterior portion which arises from the tuber ischii and a little of the ramus of the ischium and passes to be inserted into nearly the whole length of the linea aspera, the more posterior portion of its origin from the tuber running directly down to be inserted into the adductor tubercle of the femur.
2. An anterior portion, which is somewhat triangular in shape, arising from the rami of the ischium and pubes and passing out to be inserted into the upper half of the linea aspera. It is the upper part of this portion which brings the edge of the adductor magnus up to that of the quadratus femoris, and continues the insertion of the adductor magnus up to the linea quadrati. It is sometimes called the adductor quartus or minimus.

The nerve supply to the adductor magnus is from the *sciatic*, which chiefly supplies the posterior portion, and the deep branch of the *obturator*, which supplies the whole of the anterior and also sends branches into the posterior. Prof. Wilson has noticed on the other hand a tendency for the sciatic nerve filaments to usurp a portion of the muscle usually supplied by the obturator.

In the chimpanzee the ischial portion (1) is quite separate from the rest, and is inserted into the adductor tubercle, supplied by a branch of the sciatic nerve, and is altogether more like an additional hamstring than an adductor. The deep or anterior portion (2) had its lower fibres spread out over and inserted into the greater part of the popliteal surface of the femur, extending as low down as the posterior ligament of the knee-joint; this portion was innervated by the obturator nerve; and there is thus no difficulty in understanding the channel through which the nerve reaches the posterior aspect of the knee-joint, and when the muscle retires the nerve still persists. Of this fact there are other examples. In the iguana the muscle is supplied from the sacral plexus only.¹

The adductor magnus is pierced by five arteries, which come through from the front, viz. three perforating arteries from the profunda femoris, as well as its terminal branch, and the femoral artery.

¹ Dr. Hepburn, *Journal Anat. and Phys.* vol. xxvi. p. 833.

PLATE XXX.

MUSCLES

<p>A Gluteus maximus.
 B Gluteus medius.
 C Quadratus femoris.
 D Adductor magnus.
 D' Anterior portion of adductor magnus (adductor quartus).
 E Insertion of the adductor magnus into the adductor tubercle of the femur.
 F Vastus internus.
 G Gracilis.
 H Sartorius.</p> | <p>I Short head of the biceps.
 K Long head of the biceps.
 L Gastrocnemius.
 M Plantaris.
 N The popliteal space on posterior aspect of the femur.
 O Vastus externus covered with fascia.
 P Prominence at the upper extremity of the gluteal insertion, sometimes called the third trochanter.</p> |
|--|---|

VESSLES

<p>a Popliteal artery.
 b Popliteal vein.
 c Upper muscular branches of the popliteal.
 d Superior internal articular.
 e Superior external articular.
 f Deep branch of the anastomotic artery which was running along the side of vastus internus instead of in its substance.
 g Superficial branch of anastomotica magna.</p> | <p>h An accessory superficial branch of anastomotic artery.
 i Internal circumflex, terminal branch.
 k First perforating of the profunda femoris.
 l Second perforating.
 m Third perforating.
 n Fourth perforating, or terminal branch of the profunda femoris.
 o Comes nervi ischiadici from the sciatic.</p> |
|---|--|

NERVES

<p>1 Great sciatic.
 2 Internal popliteal.
 3 External popliteal.
 4 Branches from great sciatic to the hamstrings (see Plate XXVII).
 5 Branch to the adductor magnus.
 6 Branches to the biceps short head.
 7 Inferior external articular.
 8 Superior external articular.
 9 A branch running to posterior liga-</p> | <p>ment, and apparently replacing the azygos branch of internal, which was not present.
 10 Muscular branches from internal popliteal to the gastrocnemius.
 11 Superior internal articular branch from the internal popliteal.
 12 Articular branch of obturator (deep division) to the knee-joint.
 13 Long saphenous nerve.</p> |
|--|--|

PLATE XXXI.

THE POPLITEAL SPACE AND GASTROCNEMIUS.

In this plate the fascia over the popliteal space has been removed and the space cleaned of all the fatty packing material, with which the lymphatic glands have also been removed. (See Plate XXXII for diagram of cutaneous nerve supply.)

The popliteal space extends over the lower third of the posterior aspect of the femur, which is included in the bifurcation of the *linea aspera*, and about the upper sixth of the tibia. It is a lozenge-shaped space whose boundaries are—

Externally.—Biceps, outer head of gastrocnemius, and plantaris.

Internally.—Semitendinosus, semimembranosus, gracilis, sartorius, and adductor magnus, inner head of gastrocnemius.

The Floor.—Femur, posterior ligament of the knee, popliteal notch of the tibia, popliteal fascia covering over the popliteus muscle.

The whole is covered with the deep fascia of the leg, which is very strong, and has in addition to the longitudinal fibres some strong transverse fibres bracing the tendons together.

The contents of the space are—

Popliteal artery—its articular and muscular branches. *Popliteal vein* and short saphenous vein.

Internal and external popliteal nerves, their articular and muscular branches, and in the upper part of the space the *small sciatic*, which pierces the fascia to become cutaneous about midway down, and deep down the articular branch of the *obturator* nerve to the knee.

Bursæ may be divided into three internal and three external:—

Outside.

- 1 Under external head of gastrocnemius communicates with joint.
- 2 Under popliteus tendon an extension of synovial membrane of joint.
- 3 One between the biceps and external lateral ligament does not communicate with joint.

Inside.

- 1 Under internal head of gastrocnemius communicates with joint.
- 2 Between semimembranosus and back of tibia.
- 3 Between semimembranosus and inner head of gastrocnemius often communicates with joint.

Lymphatic glands, which are central, and receive the lymph from the heel and posterior part of the foot.

PLATE XXXI.

MUSCLES

A Biceps. B Semitendinosus. C Semimembranosus. D Gracilis. E Sartorius.	F Gastrocnemius. G Soleus. H Plantaris. I Peroneus longus. K Deep fascia of thigh.

VESSELS

<i>a</i> Popliteal artery. <i>b</i> Popliteal vein. <i>c</i> External or short saphenous vein. <i>d</i> Arterial comes running down with external saphenous vein.	<i>e</i> Superior external articular artery. <i>f</i> An upper muscular branch. <i>g</i> A lower muscular branch. <i>h</i> Long saphenous vein.

NERVES

1 Great sciatic. 2 External popliteal. 3 Internal popliteal. 4 Cutaneous branches of external popliteal. 5 Communicans peronei. 6 Communicans tibialis.	7 External or short saphenous nerve. 8 Muscular branches to the gastrocnemius from the internal popliteal. 9 Articular branch of the obturator nerve. 10 Lower branch of internal cutaneous. 11 Long saphenous.

PLATE XXXII.

THE SECOND VIEW OF THE CALF, SOLEUS, PLANTARIS, AND DEEP VIEW OF THE POPLITEAL SPACE.

In this plate the gastrocnemius has been removed, having been cut through near its origin and also near its junction with the soleus to form the tendo Achillis. The aponeurosis of insertion of the sartorius has been turned forwards to show the way in which the tendons of the gracilis and semitendinosus lie on its deep aspect, being incorporated with it. The fibres of these two last muscles can be traced separately into the bone only by cutting them out of the sartorius aponeurosis, a thin layer of which comes down on their deep aspect. The lower portion of the aponeurosis is continued into the deep fascia of the leg, the fibres being traceable nearly as far as the ankle. The semitendinosus and gracilis also send slips to join the fascia.

The cutaneous nerve supply of the back of the leg is shown in the annexed diagram: (a) Termination of small sciatic; (b) lower branch of internal cutaneous; (c) cutaneous twigs from the long saphenous; (d) cutaneous branches from external popliteal; (e) communicans peronei; (f) communicans tibialis (under fascia), the junction of these two (e and f) forming the short or external saphenous.

The *plantaris* muscle bears the same relation to the plantar fascia that the palmaris longus does to the palmar fascia, but it has been cut off entirely from the remainder of its tendon by the outgrowth of the heel. In most mammals this muscle supplies the perforated flexor tendons to the toes, and is far better developed than in man, where it is functionless save that it may feebly assist the action of the tendo Achillis.

The tibial origin of the soleus is secondary to the fibular origin, and is only found in man and one or two of the anthropoid apes. (Macalister.)

PLATE XXXII.

MUSCLES

A Gastrocnemius.	K Vastus externus.
B Plantaris.	L Sartorius.
C Popliteus.	M Tendon of gracilis.
D Biceps.	N Tendon of semitendinosus.
E Soleus.	O Tendon of semimembranosus.
F Placed on the deep tibial fascia over flexor longus hallucis.	P Internal lateral ligament of the knee- joint.
G Peroneus longus.	R Long external lateral ligament of the knee.
H Insertion of adductor magnus into adductor tubercle.	S External condyle and
I Vastus internus.	T Internal condyle of femur.

VESSELS

a Popliteal artery.	d Superior internal articular artery.
b Popliteal vein.	e Inferior external articular artery.
c Superior external articular artery.	

NERVES

1 Internal popliteal.	3 Muscular branch to the soleus from internal popliteal.
2 External popliteal.	
5 Nerves to popliteus from internal popliteal.

PLATE XXXIII.

DEEP VIEW OF THE CALF, LONG FLEXORS, &c.

In this plate the muscles of the calf have been removed, the tendo Achillis having been divided just above its insertion into the os calcis, the plantaris and gastrocnemius entirely removed, while the soleus has been cut away from its fibular origin, leaving the origin from the oblique line and the inner border of the tibia. Lastly, the deep tibial fascia has been removed in order to expose the long flexor muscles and posterior tibial vessels and nerve which lie under it. It is important to bear in mind this deep tibial fascia when ligaturing the posterior tibial artery, for unless this be incised much time will be lost in searching for the artery in the space between the fascia and soleus muscle. The fascia stretches across from the tibia to the fibula, being thin above, where it joins the arch of the soleus over the vessels, and gradually thickens as it descends, joining the internal and external annular ligaments respectively. It will be noticed, on reference to the plate, that very little of the tibialis posticus is seen, it being to a great extent under cover of an aponeurosis, which gives the flexor longus digitorum an origin from the fibula on its postero-internal border; from the lower part of the aponeurosis some of the fibres of the flexor longus hallucis arise. This aponeurosis has been named the deep intermuscular septum, and in well-marked muscular subjects is occasionally replaced by muscle fibres which belong chiefly to the origin of the flexor longus digitorum.

The long flexor muscles are repeated in most mammalian orders, forming there as in man the deep layer, the flexor longus hallucis having as its homologue the flexor fibularis, and the flexor longus digitorum the flexor tibialis, the tibialis posticus remaining the same. But while the flexor fibularis exists in all species with but little variation, the flexor tibialis and tibialis posticus may vary greatly in size, and in some varieties of marsupials (*Macropodidæ*) both the latter muscles are either rudimentary or wanting, the flexor fibularis alone remaining. In some of the bats the conditions are reversed, the flexor tibialis being the larger and displacing the flexor fibularis.¹

In order to render the deep view complete a separate sketch has been added showing the popliteus muscle, and also the lower posterior nerve supply of the joint; the origin of the popliteus from the posterior ligament of the knee, as well as its tendinous origin from the femur, is well shown. This deep view also shows how closely the fibres of the peroneus longus are connected at their origin with the external lateral ligament of the knee-joint, in fact some of the fibres often arise from its base. In the opossum, ox, and gibbon the peroneus longus arises directly from the external condyle of the femur and replaces the ligament, the tendon having no attachment to the fibula, and thus permitting free rotation. In the human fœtus as late as the fourth month the ligament and peroneus longus are in direct continuity, the muscle having but a slight attachment to the fibula. Thus the external lateral ligament is probably the lost tendon of the peroneus longus.²

¹ Dobson, *Journal Anat. and Phys.* vol. xvii. p. 142.

² Bland Sutton, *Ligaments—Nature and Morphology.*

PLATE XXXIII.

MUSCLES

<p>A Popliteus.
 B Soleus.
 C Upper third posterior surface of fibula from which soleus has been removed.
 D Flexor longus digitorum.
 D' Tendon of flexor longus digitorum.
 E Flexor longus hallucis.
 F Tibialis posticus.
 F' Tendon of tibialis posticus.
 G Peroneus longus.
 H Peroneus brevis.
 I Internal lateral ligament.</p> | <p>K Tendon of biceps.
 L Tendon of semimembranosus.
 M Subcutaneous surface of ext. malleolus
 N Posterior inferior tibio-fibular ligament.
 O Posterior fasciculus of external lateral ligament.
 P Tendo Achillis.
 R Upper surface of os calcis.
 S Posterior ligament of ankle-joint.
 T Gastrocnemius.
 V External lateral ligament.
 Y Plantaris.</p> |
|--|--|

VESSELS

<p>a Popliteal artery.
 b Popliteal vein.
 c Anterior tibial artery.
 d Posterior tibial artery.
 e Peroneal artery.
 f Posterior division of peroneal artery giving off articular, external calcaneal, and cutaneous branches.</p> | <p>g Communicating artery.
 h Internal calcaneal branch.
 k Internal inferior articular artery.
 l External inferior articular artery.
 m Posterior recurrent branch from the anterior tibial artery.
 n Azygos articular.</p> |
|---|--|

NERVES

<p>1 Internal popliteal.
 2 Branch from internal popliteal to popliteus muscle.
 3 Posterior tibial.
 4 Branch to tibialis posticus and flexor longus hallucis (this usually comes off the posterior tibial a little lower down).
 5 Branch to the flexor longus digitorum.
 6 Branch from the posterior tibial to the ankle-joint.</p> | <p>7, 8 Internal calcanean branches.
 9 External popliteal nerve.
 10 Inferior internal articular from the internal popliteal.
 11 Azygos articular from the internal popliteal.
 12 Branch of deep portion of the obturator nerve to knee-joint.
 13 Inferior external articular from the external popliteal.</p> |
|---|--|

The plate also shows well the insertion of the semimembranosus tendon, sending a slip to join the internal lateral ligament of the knee and an expansion which covers in the popliteus.

N.B.—The nerve to the popliteus comes off from the internal popliteal, and running down posteriorly to the muscle turns under its lower border and enters its anterior surface; the upper twig of the nerve in the small plate went direct to the superior tibio-fibular articulation.

PLATE XXXIV.

SUPERFICIAL VIEW OF THE SOLE. FIRST LAYER OF MUSCLES.

In this plate the first layer of muscles of the sole is shown, the skin having been reflected. The thick tough subcutaneous tissue which lies beneath it has been removed, and the central portion of the plantar fascia divided; the posterior portion, from which the flexor brevis digitorum arises, has been left in situ, while the anterior portion has been reflected. The plantar fascia, like the palmar, is divided into three portions, two lateral, which are thin and cover the abductores hallucis and minimi digiti respectively, and a central one, which is very thick and strong, extending from the os calcis behind to the toes in front, and sending down two intermuscular septa which completely shut off the flexor brevis from the abductors of the hallux and little toe. In front this central portion divides into five slips, and after sending a few median fibres along each toe to join the superficial fascia, each slip splits opposite the metatarsophalangeal joint into two, which pass down to be inserted on either side of the corresponding flexor tendons into the glenoid plates and deep transverse ligament. Each slip is thus perforated by the flexor tendons, while between the slips the digital nerves and artery pass to the respective toes. The fascia was originally the expansion of the tendon of the plantaris, which is very large in many mammals, and supplies the perforated flexor tendons to the toes, in some species even running on past the first phalanx to be connected to the second. Owing, however, to the outgrowth of the heel and the pressure upon it, the two parts have become entirely separated, differing in this respect from the palmaris longus, which is still connected with its expansion—the palmar fascia.

The first layer of muscles consists of three:—1. Abductor hallucis; 2. Flexor brevis digitorum; 3. Abductor minimi digiti. To these is sometimes added another, which is called the abductor ossis metatarsi quinti, or Wood's muscle. It is not always present, but when absent as a muscle it is represented by a band of fibrous tissue passing from the tubercle of the fifth metatarsal bone to the outer tubercle of the os calcis.

The flexor brevis digitorum is represented in the plate as having only three tendons. This is a common condition, but it more often has a fourth tendon to the little toe; and when this exists it is slender and weak.

In some cases the superficial digital branch of the internal plantar artery (c) anastomoses with a branch from the external, and thus forms a superficial plantar arch; while the twigs given off from it pass towards the cleft of the toes, and anastomose with the digital branches of the deep arch. Thus it is analogous to the superficial palmar arch.

PLATE XXXIV.

MUSCLES

<p>A Flexor brevis digitorum.
 A' Tendon of the flexor brevis digitorum, showing it splitting to allow the passage of the long flexor.
 B Abductor hallucis.
 C Abductor minimi digiti.
 D Abductor metatarsi quinti (Wood's muscle).</p> | <p>E Tendon of flexor longus hallucis.
 F Flexor brevis hallucis.
 G Adductor obliquus hallucis.
 H Lumbricalis.
 I Tendon of the flexor longus digitorum.
 K Flexor brevis minimi digiti.
 L Plantar fascia, central portion.</p> |
|---|--|

VESSELS

<p>a Internal plantar artery.
 b External plantar.
 c Superficial digital branch from the internal plantar sending twigs with the digital nerves.
 d Princeps hallucis from the dorsalis pedis (in this specimen it was a direct continuation of the internal plantar artery).</p> | <p>e Digital branch of external plantar which gives off the digital branch to the outer side of the little toe which is usually given off separately.
 f Internal calcaneal branches of the posterior tibial.</p> |
|--|---|

NERVES

<p>1 Internal plantar.
 2 Digital branches of internal plantar.
 3 Muscular branch from inner digital branch to the flexor brevis hallucis.
 4 Muscular branch from second digital branch to first lumbrical.
 5 Cutaneous branches from internal plantar to sole.
 6 Digital branches of the external plantar.</p> | <p>7 Communicating branch between internal and external plantar nerves.
 8 Muscular branch from outer digital to flexor brevis minimi digiti.
 9 Cutaneous branches from internal plantar to sole.
 10 Internal calcaneal branches of the posterior tibial.</p> |
|---|---|

PLATE XXXV.

THE SECOND LAYER OF MUSCLES IN THE SOLE.

In this dissection the flexor brevis digitorum has been cut away close to its origin from the os calcis, and the tendons severed from the belly of the muscle and turned forwards; the abductor minimi digiti has been turned outwards after being cut away from its origin; and the origin of the abductor hallucis partially severed, to show more completely the structures which enter the sole of the foot under cover of its origin from the internal annular ligament.

The large origin of the abductor minimi digiti from both tubercles of the os calcis and the space of bone between them, compared with the small pointed origin of the flexor brevis digitorum from the inner tubercle, is well shown.

The fibrous band marked S is called the *ligament of the fifth metatarsal*, and occupies the position of Wood's muscle, of which it is a fibrous retrogression.

The second layer of muscles in the sole comprises—

1. Flexor accessorius.
2. Tendon of flexor longus digitorum and lumbricales.
3. Tendon of flexor longus hallucis.

The tendon of the flexor longus hallucis is connected with the upper surface of the flexor longus digitorum, as they cross the sole, by a strong fibrous slip, which is chiefly traceable into the tendons of the second and third toes. In dealing with the back of the leg it was pointed out that the flexor fibularis (flexor longus hallucis) is very constant in mammals, and in most is of far greater importance as a flexor of the digits than the flexor tibialis (flexor longus digitorum). In a great number of instances it sends slips to all the toes, especially those which are functionally the most powerful; while, with the exception of the bat tribe, the tibialis is a much weaker muscle. In other cases both tendons join, and conjointly form the perforating tendons of the toes. Hence the slip which connects the flexor longus hallucis with the flexor longus digitorum is really the remains of its insertion into the other toes. Conversely the flexor digitorum sometimes sends a slip to the hallucis, but it is very rare to find the two tendons entirely separate: this last arrangement is one which belongs chiefly to the lower mammalian orders.

The flexor accessorius is nothing more than a tarsal slip of the long flexors; it is extremely useful in correcting the otherwise oblique pull of the long flexor, the resultant of the two being a nearly direct pull backwards upon the digits.

The nerve supply to the lumbricales is given in most textbooks as the two inner from the internal plantar, the two external from the external plantar, but more usually the three external are supplied by the external plantar, and only the inner by the internal, showing that possibly on account of pressure the nerve supply is removing to the deep surface of the muscle. (St. John Brooks.)

PLATE XXXV.

MUSCLES

<p>A Flexor brevis digitorum.
 A' Tendons of insertion of flexor brevis.
 B Abductor hallucis.
 C Abductor minimi digiti.
 D Accessorius inner head.
 E Accessorius outer head.
 F Tendon of the flexor longus digitorum.
 G Tendon of the flexor longus hallucis.
 H Lumbricales.
 I Flexor brevis hallucis.
 K Abductor hallucis (obliquus).
 L Flexor brevis minimi digiti.</p> | <p>M Third plantar interosseus.
 O Tendon of peroneus longus: this latter is placed on the sesamoid bone in its tendon.
 P Tubercle of the fifth metatarsal.
 R Long plantar ligament.
 S Band of fibrous tissue, the ligament of fifth metatarsal representing Wood's muscle.
 T Abductor hallucis transversus (transversus pedis).</p> |
|--|--|

VESSELS

<p>a Internal plantar.
 b Princeps hallucis.
 c External plantar.
 d Second digital of the external plantar giving off the first digital to outer side little toe.</p> | <p>e First digital.
 f Third digital.
 g Fourth digital.</p> |
|--|--|

NERVES

<p>1 Internal plantar.
 2 Cutaneous branches of internal plantar to sole.
 3 Digital branches of internal plantar.
 4 Muscular branch to abductor hallucis.
 5 Muscular branch to flexor brevis hallucis.
 6 Muscular branch to flexor brevis digitorum.
 7 Muscular branch to first lumbrical.</p> | <p>8 External plantar.
 9 Digital branches of external plantar.
 10 Cutaneous branches to sole from external plantar.
 11 Muscular branch to flexor accessorius.
 12 Muscular branch to abductor minimi digiti.
 13 Muscular branch to flexor brevis minimi digiti.</p> |
|---|---|

PLATE XXXVI.

THE THIRD LAYER OF MUSCLES IN THE SOLE.

In this dissection the long flexor tendons have been cut, and the flexor accessorius divided in order to expose more fully the next layer of muscles, which comprises—

1. The flexor brevis hallucis.
2. The adductor hallucis.
3. The transversus pedis.
4. The flexor brevis minimi digiti.

In a note on the short muscles of the thumb a table has been introduced showing a comparison of the short muscles of the hallux and pollex; the flexor brevis hallucis comparing with the outer head of the flexor brevis pollicis, the abductor with the abductor, the adductor hallucis (or oblique adductor) with the inner head of the flexor brevis pollicis, and the transversus pedis (the transverse adductor) with the adductor pollicis. There is no opponens hallucis in the foot, and in the hand the opponens is but a segmentation from the flexor brevis pollicis.

A useful comparison may also be instituted between the nerve supply of the hand and foot, the external plantar resembling the ulnar, while the internal resembles the median :—

HAND.		FOOT.	
<i>Median</i>	Three and a half fingers.	<i>Internal Plantar</i>	Three and a half toes.
	abductor pollicis.		abductor hallucis.
	flexor brevis pollicis (outer head).		flexor brevis hallucis.
	opponens pollicis.		lumbricales, two or one.
	lumbricales, two.		flexor brevis digitorum.
<i>Ulnar</i>	One and a half fingers.	<i>External Plantar</i>	One and a half toes.
	all other muscles in palm not supplied by median.		all other muscles in sole not supplied by internal plantar.

The course of the deep plantar arch may be traced by drawing a line from the mid-point between the os calcis and malleolus, across the foot to the fourth interosseous space opposite the tubercle of the fifth metatarsal, and then across the sole to the first interosseous space. This arch corresponds to the deep palmar arch in the hand, and the communicating artery from the dorsalis pedis will be analogous to the radial.

PLATE XXXVI.

MUSCLES

<p>A Abductor minimi digiti.
 B Flexor brevis digitorum.
 B' Tendon of insertion of the flexor brevis digitorum.
 C Abductor hallucis.
 D Tendon of the flexor longus digitorum.
 D' Its slips to the digits.
 E Lumbricales.
 F Flexor accessorius.
 G Tendon of flexor longus hallucis.
 H Flexor brevis hallucis.
 H' Origin of flexor brevis hallucis from cuboid.
 I Adductor hallucis (adductor obliquus hallucis).
 K Transversus pedis (adductor transversus).
 L Flexor brevis minimi digiti.
 M Tendon of peroneus longus.
 N Plantar interossei.</p> | <p>O Dorsal interossei.
 P Long plantar ligament.
 P' Placed over the ligament where it forms the sheath of peroneus longus, and gives origin to flexor brevis minimi digiti, abductor hallucis, and third plantar interossei.
 R Tubercle of the fifth metatarsal bone.
 S Fibrous band representing Wood's muscle.
 T Tendon of tibialis posticus: the latter is placed over the tubercle of the scaphoid.
 V Placed on tendon of tibialis posticus at its insertion into cuneiform bone.
 W Glenoid plates.
 X Sheath of flexor longus hallucis.
 Y } Sesamoid bones in the tendons of inser-
 Z } tion of flexor brevis hallucis.</p> |
|---|---|

VESSELS

<p>a Internal plantar.
 b Princeps hallucis (fifth digital).
 c External plantar.
 d First digital.</p> | <p>e Second digital.
 f Third digital.
 h Fourth digital.</p> |
|---|---|

NERVES

<p>1 Internal plantar.
 2 Muscular branch to abductor hallucis.
 3 Cutaneous branch to sole.
 4 Digital branches.
 5 Muscular branch to flexor brevis hallucis.
 6 External plantar.
 7 Muscular branch to accessorius.
 8 Digital branches.
 9 Twigs to supply the transversus pedis.
 10 Twigs to metacarpo-phalangeal joints entering under glenoid plates.</p> | <p>11 Muscular twigs to interossei.
 12 Continuation of external plantar under abductor hallucis to the first interosseous space.
 13 Muscular branch to flexor brevis minimi digiti.
 14 An accessory skin branch to the digital supplying skin over web of fourth and fifth toes.
 15 Nerves to three outer lumbricales from external plantar.</p> |
|--|--|

PLATE XXXVII.

THE FOURTH LAYER OF MUSCLES IN THE SOLE, DEEP PLANTAR ARCH, &c.

In this plate the origin of the adductor hallucis from the heads of the second, third, and fourth metatarsal bones has been removed, and its origin from the long plantar ligament severed. The flexor brevis hallucis and transversus pedis have also been removed from their origin.

The *fourth layer* of muscles comprises—

1. Three plantar interossei.
2. Four dorsal interossei.
3. Tendon of the peroneus longus.
4. Tendon of the tibialis posticus.

The two last are sometimes included in a distinct *fifth layer*.

The arrangement of the intrinsic muscles of the human hand and foot is merely a modification of a simple type such as is well seen in marsupials. (By 'intrinsic' is meant those muscles which do not belong to the long flexor system which includes flexor brevis digitorum, accessorius, and lumbricales.) This is—

1. A *plantar* layer of adductors to each toe.
2. An intermediate layer of paired *flexores* to each toe.
3. A *dorsal* layer of adductors to each toe.

In all cases the marginal muscles, abductor hallucis and minimi digiti, tend to reach backwards and to take an origin from the os calcis. Should the hallux or little toe be absent, the dorsal interossei tend to do the same, provided there is no rudimentary metatarsal bone to confine them.

Starting from the monotremes (Echidna), where there are a full number (five) of adductors, the tendency is for the centre ones to get suppressed until only the adductor hallucis and minimi digiti remain, and then the latter disappears, leaving the adductor hallucis remaining alone. It may also be taken as a rule that the adductors lie above, and the flexores below the external plantar nerve, and that in most mammals the adductors tend to place themselves obliquely or transversely in order to get a greater pull.

Now, in the human foot or hand the arrangement of the muscles may be taken in a similar manner, viz.—

1. A plantar or palmar set of adductors, of which the adductor hallucis and transversus pedis alone remain in the foot, and the adductor pollicis in the hand.
2. An intermediate set of flexores breves represented by the flexor brevis hallucis for pollicis, the flexor brevis minimi digiti, and three plantar interossei.
3. A *dorsal set*, abductor hallucis (or pollicis) and minimi digiti, and the four dorsal interossei; the abductors reaching back to the os calcis in the foot or carpus in the hand.

The flexor brevis hallucis is a paired flexor, the flexor brevis minimi digiti and third plantar interossei forming a second pair, the third and fourth toes in the foot and second and fourth fingers in the hand only getting one, and the second in the foot and third in the hand losing its flexor entirely.

In the human foetal foot and hand the whole of the muscles are plantar or palmar, but as development proceeds the metatarsal or -carpal bones widen out, and the dorsal interossei get pressed between them. In most animals the adult stage is similar to that of the human embryo, the muscles being entirely plantar, the bones being too closely compressed to allow room for the dorsal position; in others, where the bones are close behind but open in front, the edge of the dorsal muscles gets squeezed up between them. In the anthropoid apes they are getting more dorsal, and in man they are dorsal by developmental changes.

In most animals, as in the human embryo, the dorsal muscles are single-headed but in adult man they have become double-headed, and taken an attachment to the next metacarpal or metatarsal bone.

In speaking of the adductors it was noticed that they tend to disappear from the centre, it being most common to find an adductor hallucis, next the adductor minimi digiti, then come the adductor indicis and annularis; it is very rare to find the add. medius. The line of centre to and from which the muscles act is drawn through the third toe in most animals as in the hand, so that an adductor medius is not wanted; but in man, the gorilla, and tamandus, the line is drawn through the second toe.¹

¹ I am indebted to Professor Cunningham's 'Report on the Manus and Pes, Challenger Expedition, Zoology, vol. v., for the above information.

PLATE XXXVII.

MUSCLES

<p>A Abductor minimi digiti.
 B Flexor brevis digitorum.
 C Abductor hallucis.
 D Edge of internal annular ligament.
 E Tendon of flexor longus hallucis.
 F Tendon of flexor longus digitorum.
 G Origin of adductor hallucis from long plantar ligament.
 G' Insertion of adductor hallucis.
 H Origin of flexor brevis hallucis from cuboid.
 H' Insertion of flexor brevis hallucis, showing its two heads.
 K Transversus pedis (abductor transversus).
 L Flexor brevis minimi digiti.
 M Tendon of peroneus longus.
 M' Insertion of peroneus longus into internal cuneiform and first metatarsal bones, a distinct slip going to the second metatarsal.
 N Plantar interossei.
 O Dorsal interossei (the numbers show the different muscles in both sets).</p> | <p>P Long plantar ligament.
 Q Origin of flexor accessorius, inner head.
 R Short plantar ligament.
 S Placed over internal cuneiform on insertion of tibialis posticus.
 T Placed over scaphoid on tendon of insertion of tibialis posticus.
 U Inferior calcaneo-cuboid or spring ligament.
 V Posterior edge of external cuneiform.
 W Anterior edge of scaphoid.
 X Slip from tendon of tibialis posticus breaking up for its insertion into tarsal and metatarsal bones.
 Y Capsular ligament of first tarso-metatarsal joint.
 Z Rough surface over bases of 2, 3, 4 metatarsal bones, from which the abductor hallucis arose.
 * Glenoid plates, to the edges of which the deep slips of the plantar fascia are seen attached.</p> |
|--|---|

VESSELS

<p>a Termination of the posterior tibial artery.
 b Internal plantar.
 c External plantar.
 d First digital.
 e Second digital.
 f Muscular twigs.
 g Third digital.</p> | <p>h Fourth digital.
 k Communicating artery from the dorsalis pedis to complete the deep plantar arch.
 l Branch from k, which in this case joins the princeps hallucis, instead of forming it, the princeps coming directly from the internal plantar.</p> |
|--|--|

NERVES

<p>1 Internal plantar.
 2 External plantar.
 3 Digital branches of the external plantar (cut).
 4 Muscular branches to the flexor brevis minimi digiti.
 5 To third plantar.
 6 To fourth dorsal.
 7 To second plantar.</p> | <p>8 To third dorsal.
 9 To first plantar.
 10 To second dorsal.
 11 To first dorsal.
 12 Branches which gave off nerves to the transversus pedis and then ended by passing under the glenoid plates to supply the metatarso-phalangeal joints.</p> |
|---|---|

PLATE XXXVIII.

THE POSTERIOR TRIANGLE.

This plate shows a dissection of the posterior triangle of the neck after removal of the cervical fascia which roofs it in, and the dense fibro-fatty tissue it contains. The upper portion of the triangle is that which needs most care, as the connective tissue is extremely tough and fibrous.

The **Posterior triangle** is bounded—

In front.—By the posterior edge of the sterno-mastoid.

Behind.—By the anterior edge of the trapezius.

Below.—By the middle third of the clavicle.

The *Floor* is formed from above downward by the splenius, levator anguli scapulae, scalenus medius and posticus, and the first serration of the serratus magnus appears in the lower and outer portion of the triangle when the arm is strongly depressed.

It is divided into two triangles by the omo-hyoid muscle, which crosses its lower part obliquely, an upper and larger, the occipital, and a lower and smaller—the subclavian, the size of which varies as the omo-hyoid crosses higher or lower above the clavicle.

The *Occipital triangle* contains—

The cervical plexus, and its small occipital, great auricular, superficial cervical, descending or supra-clavicular branches, muscular branches to the levator anguli scapulae, communicating branches to

the spinal accessory (those from the third and fourth also supplying the trapezius), the spinal accessory, upper cords of the brachial plexus, nerve to the rhomboids, and nerve to the subclavius, the supra-scapular and origin of the posterior thoracic.

The transverse cervical, superficial ascending cervical and posterior scapular artery and veins, posterior jugular vein.

The glandulae concatenatae along the posterior edge of sterno-mastoid.

The *Subclavian triangle* contains—

The subclavian artery (third part), the transverse cervical and supra-scapular vessels, the end of the external and posterior jugular veins. The cords of the brachial plexus, supra-scapular and posterior thoracic nerves and nerve to the subclavius muscle.

DIAGRAM OF THE CERVICAL PLEXUS

PLATE XXXVIII.

MUSCLES

<p>A Sterno-mastoid, its sternal origin.
 A' Sterno-mastoid, its clavicular origin.
 B Platysma.
 C Splenius.
 D Levator anguli scapulæ.</p> | <p>E Scalenus anticus.
 F Scalenus medius.
 G Omo-hyoid, its posterior belly.
 H Trapezius.</p> |
|--|---|

VESSELS

<p><i>a</i> Subclavian artery.
 <i>b</i> External jugular vein.
 <i>c</i> Supra-scapular artery and vein.
 <i>d</i> Posterior scapular artery and vein.
 <i>e</i> Transverse cervical artery and vein.</p> | <p><i>f</i> Superficial ascending twig from transverse cervical.
 <i>g</i> Ascending cervical.
 <i>h</i> A muscular twig from ascending cervical.</p> |
|--|---|

NERVES

<p>1 Small occipital.
 2 Great auricular.*
 3 Superficial cervical.
 4 Spinal accessory.
 5 Communicating from third cervical to spinal accessory.
 6 Branch from fourth cervical to trapezius communicating with spinal accessory.
 7 Supra-clavicular or descending branches of cervical plexus dividing into—
 8 Acromial,</p> | <p>9 Clavicular, and
 10 Sternal branches.
 11 Nerve to levator anguli scapulæ.
 12 Nerve to rhomboids, sending also a twig to levator.
 13 Supra-scapular nerve.
 14 Posterior thoracic.
 15 Twig from posterior thoracic to first serration of serratus magnus.
 16 Nerve to subclavius.
 17 Phrenic nerve.
 18 Cords of brachial plexus; the figure is placed on the fifth cervical.</p> |
|---|---|

* 2' is a large auricular branch from the small occipital, which took the place of the mastoid branch of the great auricular.

PLATE XXXIX.

ANTERIOR TRIANGLE, SUPERFICIAL VIEW.

In this dissection, after the skin was removed, the platysma was cut across, and its upper portion turned over the jaw. The cervical fascia and the superficial lymphatic glands lying in the submaxillary triangle were removed and the space cleaned of fat.

The following diagram has been introduced to show a plan of the superficial veins of the neck: (a) Temporal; (b) internal maxillary; (c) posterior auricular; (d) anterior branch of temporo-maxillary going to join the facial; (e) external jugular formed by the junction of the posterior auricular and posterior branch of the temporo-

maxillary; (f) posterior external jugular, which usually receives the mastoid vein from the lateral sinus; (g) placed between the transverse cervical and the supra-scapular veins; (h) facial; (i) submental; (k) anterior jugular; (l) lingual; (m) superior thyroid; (n) middle thyroid; (o) internal jugular; (p) subclavian; (r) jugulo-cephalic; (s) deep facial which communicates with the pterygoid plexus, this plexus receives a vein through the foramen Vesalii from the cavernous sinus; (t) communication between the angular vein and the ophthalmic (which flows into the cavernous sinus).

PLATE XXXIX.

MUSCLES

A Sterno-mastoid.
 A' Its separate sternal origin.
 B Sterno-hyoid.
 C Sterno-thyroid.
 D Thyro-hyoid.
 E Omo-hyoid.
 E' Tendon of omo-hyoid.
 F Hyoglossus.
 G Stylo-hyoid.
 H Digastric.
 I Thyro-hyoid membrane.

K Supra-hyoid aponeurosis, tying the tendon of digastric to hyoid bone.
 L Mylo-hyoid.
 M Masseter.
 N Platysma.
 O Parotid gland.
 P Submaxillary gland.
 R Retrahens aurem.
 S Mastoid process.
 T Pectoralis major.
 V Clavicle.

VESSELS

a Facial artery.
 b Submental branch of facial.
 c Posterior auricular artery.
 d External jugular vein.
 e Anterior division of the temporo-maxil-

lary vein joining facial.
 f Facial vein.
 g Anterior jugular vein.
 h Submental vein which forms a junction with the anterior jugular.

NERVES

1 Superficialis colli.
 2 Its communication with the facial.
 3 Great auricular.
 4 Infra-mandibular branch of facial.
 5 Mylo-hyoid branch of inferior dental.

6 Posterior auricular branch of the facial.
 7 Hypoglossal.
 8 Thyro-hyoid branch of the hypoglossal.
 9 Branch from the descendens noni (cervicis) to the sterno-hyoid.

In this plate great care was taken to keep the anterior edge of the sterno-mastoid as nearly in its normal position as it was possible.

To mark out the course of the external jugular vein draw a line from the angle of the jaw to the middle of the clavicle; the vein runs deep to and parallel with the fibres of the platysma muscle, thus in venesection the incision must be made transversely to the course of the vein, so that the muscle fibres may gape and expose it.

The posterior external jugular, very variable in size, is the remains of an important fetal vein which drained the blood from the lateral sinus through the post-glenoid foramen. This persists in the adult as the mastoid vein which communicates with the lateral sinus and empties externally into the posterior external jugular. (Professor Macalister considers this the true external jugular.)

The anterior jugular is very variable in size, and its communication across the front of the neck with the one on the opposite side must be borne in mind during tracheotomy, as it is often much congested. In the lower part of its course under the sterno-mastoid it runs parallel to the clavicle, and in tenotomy of the muscle for torticollis this should be remembered.

PLATE XL.

THE ANTERIOR TRIANGLE—SECOND VIEW.

In this dissection the anterior edge of the sterno-mastoid has been turned back to expose the structures lying beneath it.

The **Anterior triangle** of the neck is bounded—

In front.—By the middle line.

Above.—By the body of the jaw, and a line drawn from it to the mastoid process.

Behind.—By the sterno-mastoid.

This space is subdivided into three smaller triangles by the passage across it of the omo-hyoid muscle below and the digastric above.

i. The **lower carotid** or tracheal is bounded—

In front.—By the middle line.

Above.—By the omo-hyoid.

Behind.—By the sterno-mastoid.

Floor is formed by the longus colli and scalenus anticus.

Contents.—Sterno-hyoid and thyroid muscles, together with the twigs from the ansa hypoglossi. Carotid sheath, containing the carotid artery, internal jugular vein and vagus nerve; inferior thyroid artery, sympathetic with middle cervical ganglion, recurrent laryngeal nerve, thyroid gland and middle and inferior thyroid veins, lower part of larynx, trachea, and oesophagus.

ii. The **upper carotid triangle** is bounded—

Above.—By the digastric.

Below.—By the omo-hyoid.

Behind.—By the sterno-mastoid.

Floor is formed by parts of the thyro-hyoid, thyro-hyoid membrane, hyoglossus, middle and inferior constrictors of the pharynx.

Contents.—Common, internal and external carotids, superior thyroid, lingual, facial, occipital, and ascending pharyngeal arteries. Internal jugular superior thyroid, facial, lingual, ascending pharyngeal and occipital (sometimes) veins. Hypoglossal, descendens noni, twig to thyro-hyoid from hypoglossal, vagus, sympathetic, superior laryngeal, with its external laryngeal branch; spinal accessory. Parts of the larynx and pharynx.

iii. The **submaxillary triangle** is bounded—

Above.—By the body of the jaw, and line drawn from this to the mastoid process.

Below.—By the digastric (posterior belly) and stylo-hyoid muscles.

In front.—By the middle line.

Floor is formed by anterior belly of digastric, mylo-hyoid and hyoglossus.

Contents.—Submaxillary gland, facial artery and vein, mylo-hyoid vessels and nerve, and submental vessels; posteriorly is the external carotid artery in the parotid gland, giving off the temporal internal maxillary and posterior auricular branches and facial nerve; deeper than this lies the internal carotid artery, internal jugular vein and the vagus, separated from the external carotid by the stylo-glossus and stylo-pharyngeus muscles and glosso-pharyngeal nerve. These are separated from the structures in the anterior portion of the triangle by the stylo-mandibular ligament, which is really only a process of the deep cervical fascia, and should not be called a ligament.

PLATE XL.

MUSCLES

A Sterno-mastoid.	O Splenius.
B Sterno-hyoid.	P Levator anguli scapulæ.
C Sterno-thyroid.	R Scalenus medius.
D Thyro-hyoid.	S Scalenus anticus.
E Omo-hyoid.	T Deep surface of trapezius.
F Stylo-hyoid.	U Parotid gland.
G Hyoglossus.	V Submaxillary gland.
H Digastric.	W Great cornua of hyoid bone.
K Supra-hyoid aponeurosis.	X Thyro-hyoid membrane.
L Mylo-hyoid.	Z Pomum Adami.
M Masseter.	† Lymphatic glands under sterno-mas-
N Platysma.	toid.

VESSELS

a Common carotid.	thyroid.
b External carotid.	k Submental branch of facial.
c Internal carotid.	l Internal jugular vein.
d Occipital artery.	m Anterior division of temporo-maxillary
e Facial artery.	vein joining facial vein.
f Sterno-mastoid branch of occipital.	o External jugular.
g Superior thyroid.	p Posterior auricular vein.
h Superior laryngeal branch of superior	r Posterior auricular artery.
thyroid.	s Supra-scapular artery.
i Sterno-mastoid branch of superior	

NERVES

1 Hypoglossal.	9 Communication from third and fourth
2 Descendens noni or cervicis.	cervical to join spinal accessory in
3 Twig from hypoglossal to thyro-hyoid.	trapezius.
4 Twig from descendens noni to sterno-	10 Supra-clavicular branches of cervical
hyoid.	plexus.
5 Spinal accessory.	11 Cords of brachial plexus.
6 Great auricular.	12 Posterior auricular branch of facial.
7 Small occipital.	13 Mylo-hyoid branch of inferior dental.
8 An accessory or third occipital from the	14 Superior laryngeal branch of vagus.
third cervical.

PLATE XLI.

THE SIDE OF THE NECK WITH THE STERNO-MASTOID MUSCLE REMOVED.

In this dissection, which is a deeper one on the same subject as plates 39 and 40, the sterno-mastoid muscle has been cut across its centre and the upper half turned up and left to show the course of the spinal accessory nerve, while the lower part with the inner half of the clavicle has been removed. Thus the two triangles have been thrown into one.

The accompanying diagram has been introduced to show the structures covered by the sterno-mastoid muscle. They are:

Muscles. — Sterno-hyoid and thyro-hyoid, scalenus anticus and medius, rectus capitis anticus major, splenius, levator anguli scapulae; digastric, omo-hyoid, edge of thyro-hyoid, inferior constrictor of the pharynx, deep cervical fascia.

Vessels. — Common, external, internal carotids, superior thyroid and its sterno-mastoid branch, facial, lingual, occipital, posterior auricular, thyro-hyoid axis and its branches, inferior thyroid with the ascending cervical, transverse cervical, supra-scapular; internal jugular, facial and superior thyroid, middle thyroid, anterior jugular and external jugular veins.

Nerves. — Hypoglossal, spinal accessory, descendens noni or cervicis, ansa hypoglossi and communicans noni; the roots of the cervical and brachial plexuses, phrenic and facial, small occipital, great auricular, superficial cervical, supra-clavi-cular nerves.

Glands. — Parotid and deep lymphatic glands.

Bones. — Mastoid process, transverse processes of the cervical vertebræ, sternum.

Joint. — Sterno-clavicular.

1. Spinal accessory. 2. Small occipital. 3. Great auricular. 4. Superficial cervical. 5. Supra-clavi-cular. 6, 7, 8. Cords of brachial plexus. 9. Twigs from ansa hypoglossi. 10. Hypoglossal. The phrenic nerve has unfortunately been missed out in the diagram.

PLATE XLI.

MUSCLES

A Sterno-mastoid.	O Supra-hyoid aponeurosis.
B Trapezius.	P Stylo-hyoid.
C Splenius capitis.	R Hyoglossus.
D Splenius colli.	S Masseter.
E Levator anguli scapulæ.	T Platysma.
F Scalenus medius.	U Thyro-hyoid membrane.
G Scalenus anticus.	V Submaxillary gland.
H Omo-hyoid.	W Thyroid gland.
I Sterno-hyoid.	X Subclavius muscle.
K Sterno-thyroid.	Y Capsular ligament of lower jaw.
L Thyro-hyoid.	Z Inferior constrictor of pharynx.
M Crico-thyroid.	† Stenson's duct.
N Digastric.	

VESSELS

a Left common carotid.	m Internal carotid.
b Right common carotid.	n External carotid.
c Left internal jugular vein.	o Facial artery.
d Subclavian vein.	p Occipital artery.
e External jugular vein.	r Posterior auricular.
f Supra-scapular vein.	s Temporal
g Subclavian artery.	t Transverse facial branch of temporal.
h Supra-scapular artery.	v Superior thyroid.
i Transverse cervical.	x Superior laryngeal branch of superior thyroid.
k Inferior thyroid.	z Middle thyroid vein.
l Ascending cervical branch of inferior thyroid.	

NERVES

1 Facial.	accessory.
2 Temporal branch of facial.	21 Small occipital.
3 Malar and infra-orbital branches.	22 Great auricular.
4 Buccal branch.	23 Superficial cervical.
5 Supra-mandibular branch.	24 Twig of communication from third cervical to spinal accessory.
6 Infra-mandibular branch.	25 Twig of communication from third and fourth cervical to spinal accessory also supplying trapezius.
7 Posterior auricular branch.	26 Muscular branch to levator anguli scapulæ.
8 Communication between facial and auriculo-temporal.	27 Phrenic nerve.
9 Spinal accessory.	28 Nerve to subclavius.
10 Hypoglossal.	29 Posterior thoracic.
11 Descendens noni.	30 Muscular twigs from ansa hypoglossi to sterno-thyroid.
12 Second cervical.	31 Superior laryngeal.
13 Third cervical.	32 Supra-clavicular branches of cervical plexus.
14 Fourth cervical.	33 Left recurrent laryngeal.
15 Fifth cervical.	
16 Sixth cervical.	
17 Seventh cervical.	
18 Eighth cervical.	
19 Communicans noni.	
20 Twig from second cervical to spinal	

PLATE XLII.

THE SUBOCCIPITAL TRIANGLE.

In this dissection the trapezius was completely removed on the right side to expose the complexus and splenius, on the left the splenius was cut away from its origin from the ligamentum nuchæ and supraspinous ligament and turned outwards, showing its division into splenius colli and capitis. The complexus was then divided about its centre, and the ends turned up and down to expose the suboccipital triangle which lies beneath it.

The suboccipital triangle corresponds to the space between the inferior curved line of the occiput and the level of the spine of the axis, and is bounded

Internally.—By the rectus capitis posterior major and minor.

Externally.—By the superior oblique.

Below.—By the inferior oblique.

Floor.—Formed by the posterior occipito-atlantal ligament and the posterior arch of the atlas.

Contents.—Suboccipital nerve and its branches to the recti postici, obliques, and complexus; vertebral artery with some muscular branches and the commencement of the vertebral vein.

The following diagram shows the arrangement of the posterior primary branches of the upper cervical nerves. It may be remembered as a general rule that all the internal branches of the posterior divisions of the spinal nerves as far as the sixth dorsal

(thoracic) give off cutaneous branches, while the external supply muscles. Below, this arrangement is reversed, the outer branches giving off the cutaneous twigs, and the internal, muscular; the exceptions being the first cervical, which does not split, and the first two lumbar, which supply no skin branches at all. (a) Posterior and (b) anterior divisions of the suboccipital nerve.

PLATE XLII.

MUSCLES

<p>A Complexus (right).
 A' Complexus (left) cut.
 B Inner portion of complexus, known as biventer cervicis.
 C Splenius capitis.
 C' Splenius colli.
 D Right sterno-mastoid.
 E Cervical fascia over the sterno-mastoid.
 F Trapezius.
 F' Origin of trapezius from superior curved line and external protuberance of occipital bone.
 G Levator anguli scapulæ.
 H Serratus posticus superior.
 H' Insertion of serratus into ribs.
 I Rhomboideus minor.
 K Rhomboideus major.
 L Triangular smooth surface at base of spine of scapula.</p> | <p>M Semispinalis colli.
 N Transversalis colli.
 O Cervicalis ascendens.
 P Scalenus posticus.
 Q The ribs; the numbers show their order.
 R Left sterno-mastoid.
 S Rectus capitis posticus minor.
 T Rectus capitis posticus major.
 V Inferior oblique.
 W Superior oblique.
 X Trachelo-mastoid.
 Y Articular processes of cervical vertebrae.
 2 = second and third.
 3 = third and fourth.
 4 = fourth and fifth, &c.
 Z Posterior arch of atlas.
 † External occipital protuberance.</p> |
|--|--|

* The numbers in the centre line mark the position of the spines of the cervical and dorsal vertebrae.

VESSELS

<p>a Vertebral artery.
 b Occipital artery.
 c Princeps cervicis, a branch of the occipital.</p> | <p>d Profunda cervicis, a branch of the superior intercostal ascending to anastomose with the princeps.
 e A twig from the posterior scapular.</p> |
|--|--|

NERVES

<p>1 Suboccipital.
 2 Its anterior division.
 3 Its branch to the inferior oblique, also sending a twig to join the <i>great occipital</i>.
 4 Its branch to the recti postici.
 5 Its branch to the superior oblique which also sent a twig to complexus.
 6 Great occipital (internal branch of posterior division of second cervical).
 7 External muscular branch of second</p> | <p>cervical.
 8 Internal branch of third cervical which joins great occipital after piercing complexus.
 9 External muscular branch of third.
 10 Internal branch of fourth.
 11 External branch of fourth.
 12 Internal branch of fifth.
 13 External branch of fifth.
 14 Small occipital.</p> |
|---|--|

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PLATE XLIII.

THE FACE.

This dissection shows as far as possible the structures of the face; no attempt was made to dissect out the small muscles of the nose, but the rest of the structures are well shown. The accompanying diagram shows the cutaneous nerves of the head and neck.

(A) supra-clavicular (3 + 4 C); (B) superficialis colli (2 + 3 C); (C) great auricular (2 + 3 C); (D) small occipital (2 C); (E) great occipital (posterior division of 2 + 3 C); (F) auriculo-temporal (3rd division of 5th); (G) temporal twig of temporo-malar (2nd division of 5th); (H) supra-orbital; (I) lachrymal; (K) frontal; (L) twigs from infra-trochlear loop (all from 1st division of 5th); (M) infra-orbital (2nd division of 5th); (N) malar branch of temporo-malar (2nd division of 5th); (O) nasal nerve (1st division of 5th); (P) mental branch of inferior dental (3rd division of 5th).

There was no division of the zygomatic muscle into major and minor; in fact the latter is but a slip of the major which has remained separate from its anterior edge. Nor is there any separation, as a rule, between the adjacent edges of the levator labii superioris and the levator labii superioris alæque nasi, and but a faint attempt at division; in fact the whole should be called the

levator labii superioris, some of whose inner fibres get an insertion into the alæ of the nose. In the chimpanzee these four muscles, the two zygomatici and the two levators, are united to form one broad muscle which arises round the circumference of the orbit and runs down to be inserted into the upper lip.

PLATE XLIII.

MUSCLES

- A Anterior muscular portion of occipito-frontalis.
- B Its intermuscular aponeurosis.
- C Orbicularis palpebrarum (its orbicular portion).
- D Orbicularis palpebrarum (its palpebral portion).
- E Pyramidalis nasi.
- F Compressor nasi.
- G Levator labii superioris alæque nasi.
- H Levator labii superioris.
- I The orbicular zygomaticus.
- K Zygomaticus major.
- L Levator anguli oris.
- M Depressor anguli oris.
- N Depressor labii inferioris.

- O Platysma.
- P Part of the platysma which often becomes slightly separated from the remainder of the muscle, and is called the Risorius.
- R Buccinator.
- S Orbicularis oris.
- T Masseter.
- U Parotid gland.
- V Socia parotidis, and Stenson's duct.
- W Zygomatic arch.
- X Placed on the temporal fascia over temporal muscle.
- Y Cervical fascia covering parotid gland turned back.

VESSELS

- a Facial artery.
- b Common origin of the inferior labial and coronary.
- c Inferior coronary.
- d Submental branch of facial turning upwards to anastomose with the inferior labial.
- e Superior coronary.
- f Artery to the septum from the superior coronary.
- g Lateralis nasi.
- h Angular artery.
- k Dorsalis nasi.

- l Nasal dividing into dorsalis nasi and an anastomotic branch to the angular.
- m Transverse facial.
- n Infra-orbital.
- o Temporal artery dividing into
- p Its posterior and
- r Its anterior division.
- s Middle temporal.
- t Temporal vein.
- v Angular vein.
- w Facial vein.
- x Deep facial.

NERVES

- 1 Auriculo-temporal (third division of fifth).
- 2 Temporal twig of orbital (second division of fifth).
- 3 External branch of nasal (first division of fifth).
- 4 Temporal branch of facial.
- 5 Malar branch of facial.

- 6 Infra-orbital branch of facial.
- 7 Buccal branch of facial.*
- 8 Supra-mandibular branch of facial.
- 9 Infra-orbital (second division of fifth).
- 10 Palpebral branches of infra-orbital.
- 11 Labial branches of infra-orbital.
- 12 Great auricular.

* In the plate this number has been placed on the wrong branch; it should have been written on the nerve just above T.

PLATE XLIV.

FIRST VIEW OF THE PTERYGOID REGION WITH THE MASSETER MUSCLE REMOVED.

In this dissection the zygomatic arch was sawn through in front of the external lateral ligament of the jaw and just behind the attachment of the zygomaticus major to the malar bone, and both arch and masseter muscle turned down. The sterno-mastoid and splenius capitis were cut close to their insertion into the mastoid process, and part of the skull on either side of the superior curved line sawn away to expose the lateral sinus.

A probe has been introduced into the front of the sinus to show how it dips downwards, grooving the mastoid process in the fossa sigmoidea. The external auditory meatus is the remnant of the visceral cleft between the mandibular and hyoid arches. The lateral sinus varies considerably in its course, but, roughly speaking, it runs down on the mastoid, opposite the line of reflection of the skin, on to the pinna posteriorly. The accompanying diagram shows the usual course of the lateral sinus (A) upon the exterior of the

skull, and the position of a trephine hole (B) to expose it, the point of a $\frac{3}{4}$ -inch trephine being placed $1\frac{1}{4}$ inch behind the meatus, and on a level with its upper border, *i.e.* $\frac{1}{4}$ inch above the centre of the meatus. Its course, however, varies extremely in its position and extent, but generally it lies $\frac{1}{2}$ inch behind the external auditory meatus; hence in tapping the antrum mastoidea place the drill (C), which should be $\frac{1}{4}$ inch diameter, as near as possible to the posterior edge of the meatus on a level with its upper limit; do not penetrate more than $\frac{3}{4}$ inch, or the risk will be run of injuring the external semicircular canal; the cells are usually opened at a depth of $\frac{3}{8}$ inch. If the drill is placed more posteriorly, risk is run of perforating the lateral sinus. The line marked (D) in diagram is Reed's base line, which is drawn from the lower margin of orbit through centre of meatus, and usually touches the external occipital protuberance or falls a little below it.

PLATE XLIV.

MUSCLES

A Temporal.	N Inferior oblique.
B Masseter.	O Superior oblique.
C Platysma.	P Complexus.
D Buccinator.	R Trapezius.
E Zygomaticus major.	S Zygomatic arch.
F Levator labii superioris.	T Transverse process of first cervical vertebra.
G External pterygoid.	V External occipital protuberance.
H Insertion of sterno-mastoid.	X Dura mater.
I Splenius capitis.	Y Stenson's duct.
K Trachelo-mastoid.	Z Styloid process.
L Splenius colli.	
M Digastric (posterior belly).	

VESSELS

a Facial artery.	of the internal maxillary.
b Inferior labial.	g Temporal artery.
c Buccal branch of the internal maxillary.	h Posterior auricular artery.
d Deep temporal coming off in a common trunk with	i Occipital artery.
e The masseteric artery.	k The princeps cervicis from the occipital.
f Alveolar branch from the third division	l Internal jugular vein.
	m Lateral sinus (laid open).

NERVES

1 Masseteric branch of third division of fifth.	4 Second cervical.
2 Facial nerve.	5 Buccal branch of third division of fifth.
3 Spinal accessory.

PLATE XLV.

SECOND VIEW OF THE PTERYGOID REGION, TEMPORAL MUSCLE, AND PART OF RAMUS OF JAW REMOVED.

This plate shows a deeper dissection of the same subject as the previous drawing. The coronoid process has been cut through at its base and turned upwards with the temporal muscle, and the ramus of the jaw sawn through just below the pterygoid fossa and above the inferior dental foramen and removed, exposing the first and second portions of the internal maxillary artery.

The first portion of the artery passes between the ramus of the jaw and the so-called long internal lateral ligament; it is generally described as giving off four branches, but it is much more usual to find only two, viz., the inferior dental and middle meningeal, the latter giving the tympanic and small middle meningeal. All these four arteries pass through bony foramina.

The second portion of the artery varies in its course, being sometimes superficial and sometimes deep to the external pterygoid muscle, the proportion given on the conjoint investigation of the Anatomical Committee being 54 per cent. above, and 44 per cent. below; this portion of the artery gives off four sets of muscular branches—buccal, pterygoids, temporal, and masseteric, and one arterial comes to the lingual nerve.

The third portion of the artery lies in the spheno-maxillary fossa, and gives six branches which all pass through bony foramina alveolar, infra-orbital, posterior pharyngeal, Vidian, posterior palatine, naso-palatine.

The long internal lateral or spheno-mandibular ligament is a thin loose band of fibrous tissue which stretches across from the spinous process of the sphenoid to the inner edge of the inferior dental foramen. It is too lax to be of much use as a ligament, and is really the fibrous remains of a part of the Meckelian bar of cartilage.

PLATE XLV.

MUSCLES

A Temporal.	N Trapezius.
B Masseter.	O Trachelo-mastoid.
C Buccinator.	O' Insertion of Trachelo-mastoid into mastoid process.
D External pterygoid.	P Splenius capitis.
E Internal pterygoid.	R Splenius colli.
F Long internal lateral ligament (spheno- mandibular).	S Inferior oblique.
G Stylo-glossus.	T Insertion of the sterno-mastoid.
H Styloid process.	V Zygomaticus major.
I Digastric (posterior belly).	X Levator labii superioris.
K Rectus capitis lateralis.	Y Capsule of the lower jaw.
L Superior oblique.	Z Depressor angulioris and labii inferioris.
M Complexus.	

VESSELS

a External carotid.	h Alveolar.
b Temporal.	i Masseteric.
c Internal maxillary.	k Posterior auricular.
d Middle meningeal branch of internal maxillary.	l Occipital.
e Inferior dental.	m Princeps cervicis branch of occipital.
f Buccal.	n Facial.
g Deep temporal.	o Lateral sinus.
	p Internal jugular vein.

NERVES

1 Lingual.	division of fifth.
2 Inferior dental.	8 Auriculo-temporal.
3 Mylo-hyoid branch of inferior dental.	9 Posterior dental from second division of the fifth.
4 Mental branch of inferior dental.	10 Facial.
5 Buccal branch of third division of fifth.	11 Spinal accessory.
6 Masseteric branch of the third division of fifth.	12 Second cervical.
7 Deep temporal branches of third	13 Hypoglossal.

PLATE XLVI.

THIRD VIEW OF PTERYGOID REGION AND ORBIT FROM THE OUTER SIDE.

In the dissection represented in this plate the capsule of the temporo-mandibular joint has been cut, and the condyle of the jaw, its interarticular cartilage, and the external pterygoid have been pulled forwards to expose the third division of the fifth nerve which lies behind it. Two saw cuts have been made through the outer wall of the orbit parallel to the floor and roof, and the outer wall partly cut away and partly turned forwards. In chipping away the posterior part to allow a better view, the dura mater of the middle fossa of the skull has been exposed.

In the plate the stylo-mastoid artery is shown as a branch from the occipital; this is not unfrequently the case when the vessel is not given off by the post-auricular.

PLATE XLVI.

MUSCLES

A Temporal	S Levator anguli scapulæ.
B External pterygoid.	T Splenius.
C Buccinator.	V Trachelo-mastoid.
D Internal pterygoid.	W Complexus.
E Digastric.	X Transverse process of atlas.
F Styloid process.	Y Great cornua of hyoid bone.
G Stylo-glossus.	Z Condyle of lower jaw covered by its
interarticular cartilage.
H Stylo-pharyngeus.	A' External rectus.
I Stylo-hyoid.	B' Inferior oblique (oculi).
K Omohyoid.	C' Inferior rectus.
L Thyro-hyoid.	D' Superior rectus.
M Inferior constrictor.	E' Dura mater ensheathing orbit.
N Thyro-hyoid membrane.	F' Dura mater of middle fossa.
O Rectus capitis lateralis.	G' Lachrymal gland.
P Superior oblique.	H' Inner surface of malar bone turned out.
R Inferior oblique.	

VESSELS

a Common carotid.	m Its inferior dental branch.
b Internal carotid.	n Its middle meningeal branch.
c External carotid.	o A pterygoid branch.
d Superior thyroid.	p Ascending pharyngeal artery.
e Superior laryngeal branch of d.	r Temporal.
f Lingual.	s Ophthalmic.
g Facial.	t Lachrymal branch of ophthalmic.
h Occipital.	v Ciliary arteries.
i Stylo-mastoid branch of occipital.	x A branch from internal maxillary which
accompanied the orbital nerve to
malar bone.
k Princeps cervicis.	
l Internal maxillary.	

NERVES

1 Lingual.	12 Supra-orbital.
2 Inferior dental.	13 Pneumo-gastric.
3 Buccal.	14 Hypoglossal.
4 Muscular branch to external pterygoid.	15 Descendens noni or cervicis.
5 Deep temporal branches.	16 Branch from descendens noni to omo-
hyoid anterior belly.
6 Auriculo-temporal.	17 Superior laryngeal from vagus.
7 Chorda tympani.	18 Second cervical.
8 Sixth nerve.	19 Spinal accessory.
9 Inferior division of third nerve.	20 Facial.
10 Ophthalmic ganglion.	21 Glosso-pharyngeal.
11 Lachrymal.	

PLATE XLVII.

DEEP VIEW OF THE PTERYGOID REGION AND SIDE OF NECK, GASSERIAN GANGLION, MUSCLES OF TONGUE.

This dissection is a continuation of the one in Plate XLVI.; the left side of the jaw having been completely removed to near the symphysis; the tongue was drawn out and fastened by a stitch to the tip of the nose, while the great wing of the sphenoid was chiselled away to expose the Gasserian ganglion. The styloid process was next cut off to expose more completely the structures lying deep to it.

Between the tensor and levator palati muscles is a whitish band; this is the cartilaginous portion of the Eustachian tube, which was left unlettered from want of space.

PLATE XLVII.

MUSCLES

A Mylo-hyoid.
B Genio-hyoid.
C Genio-hyo-glossus.
D Hyo-glossus.
E Stylo-glossus.
F Stylo-pharyngeus.
G Superior constrictor of pharynx.
H Middle constrictor.
I Inferior constrictor.
J Thyro-hyoid membrane.
K Thyro-hyoid.
L Insertion of the sterno-thyroid.
M Crico-thyroid.
N Thyroid gland.
O Trachea.
P Esophagus.
R Aponeurosis of pharynx.
S Levator palati.
T Tensor palati.
U Styloid process.
V Buccal mucous membrane turned up.
W Rectus capitis lateralis.
X Inferior oblique.

Y Superior oblique.
Z Transverse process of atlas.
* Transverse process of sixth cervical vertebra.
A' Complexus.
B' Trachelo-mastoid.
C' Splenius.
D' Levator anguli scapulæ
E' Trapezius.
F' Scalenus medius.
G' Scalenus anticus.
H' Longus colli.
I' Rectus capitis anticus major.
K' Inferior oblique (oculi).
L' Inferior rectus (oculi).
M' Superior rectus (oculi).
N' External rectus (oculi).
O' Levator palpebræ.
P' Lachrymal gland.
R' Dura mater of middle fossa of skull.
S' Antrum of Highmore.
T' A portion of the submaxillary gland.
U' Wharton's duct.

PLATE XLVII.—(Continued.)

VESSELS

<i>a</i> Left common carotid.	<i>m</i> Infra-orbital.
<i>b</i> Internal carotid.	<i>n</i> Lachrymal.
<i>c</i> External carotid.	<i>o</i> Ophthalmic.
<i>d</i> Occipital.	<i>p</i> Internal carotid in the cavernous sinus.
<i>e</i> Facial.	<i>r</i> Right common carotid.
<i>f</i> Lingual.	<i>s</i> Subclavian.
<i>g</i> Superior thyroid.	<i>t</i> Vertebral.
<i>h</i> Superior laryngeal branch of superior thyroid.	<i>v</i> Inferior thyroid.
<i>i</i> Ascending pharyngeal.	<i>w</i> Ascending cervical.
<i>k</i> Middle meningeal.	<i>x</i> Transverse cervical.
<i>l</i> Termination of the internal maxillary.	<i>y</i> Supra-scapular.
	<i>z</i> Internal jugular.

NERVES

1 Gasserian ganglion.	18 Submaxillary ganglion.
2 Ophthalmic division or first division of fifth nerve.	19 Communication between the lingual and hypoglossal.
3 The lachrymal from first division of fifth.	20 Glosso-pharyngeal.
4 The nasal nerve from first division of fifth.	21 Its muscular branch to stylo-pharyngeus.
5 Ganglionic branch of the nasal nerve.	22 Its pharyngeal branch.
6 Inferior division of the third nerve to inferior oblique and inferior rectus; the short or motor root of the ganglion also comes off from this branch, the figure is directly under the ganglion.	23 Hypoglossal.
7 Short ciliary branches from ganglion.	24 Communication from first cervical to hypoglossal.
8 Sixth nerve.	25 Descendens noni.
9 Second division of fifth passing through foramen rotundum.	26 Branch from hypoglossal to thyrohyoid.
10 Infra-orbital.	27 Vagus.
11 Posterior dental.	28 Pharyngeal branch of vagus.
12 Third division of fifth passing through foramen ovale.	29 Superior laryngeal branch of vagus.
13 Muscular branches from motor portion of third division of fifth.	30 Internal laryngeal division of 29.
14 Auriculo-temporal from third division of fifth.	31 External laryngeal division of 29.
15 Inferior dental from third division of fifth.	32 Superior cervical ganglion of sympathetic.
16 Chorda tympani from facial joining lingual.	33 Cervical trunk of sympathetic.
17 Lingual from third division of fifth.	34 Middle cervical ganglion.
	35 Spinal accessory.
	36 First cervical.
	37 Second cervical.
	38 Third cervical.
	39 Fourth cervical.
	40 Phrenic.
	41, 42, 43 Communication between sympathetic and cervical nerves.
	44 Cords of brachial plexus.

PLATE XLVIII. NATURAL SIZE.

INTERIOR OF SKULL, TENTORIUM, CIRCLE OF WILLIS,
FIRST VIEW OF ORBITS.

In this plate the calvarium has been removed in the usual way by a horizontal saw cut, and the brain carefully removed so as to leave intact the arteries composing the circle of Willis in their normal positions with relation to the nerves. The best way of doing this in the ordinary dissecting-room subject is to use a stream of water either from a syringe or tap and allow it to wash away the brain. On the left side the attached edge of the tentorium has been cut into to expose the lateral sinus.

The orbits were then opened in the usual manner, but if the dissector wishes to preserve the pulley of the superior oblique in situ, it will be best to place the tip of a finger in the inner corner of the orbit and saw through directly external to it.

The arteries comprising the circle of Willis are, the basilar behind dividing into the posterior cerebrals; the internal carotids on either side in front giving off the anterior cerebrals, which are joined in front by a short trunk of somewhat variable size, the anterior communicating, and the middle cerebrals which are connected by means of the posterior communicating with the posterior cerebrals; the posterior communicating are very variable in size and may not be of the same calibre on both sides of the body.

Thus is established a great circle of anastomosis at the base of the brain.

PLATE XLVIII. NATURAL SIZE.

MUSCLES

<p>A Tentorium cerebelli.
 B Free edge of the tentorium passing forward to be attached to the anterior clinoid process.
 C Anterior cut extremity of the falx cerebri.
 D Posterior cut edge of the falx cerebri, at its junction with the tentorium.
 E Placed over the upper border of the dorsum sellæ.
 F Anterior clinoid process.
 G Olivary process.</p> | <p>H Levator palpebræ.
 I Superior rectus.
 K Superior oblique.
 L Tendon of superior oblique.
 M Sclerotic coat of eyeball.
 N Lachrymal gland.
 O Pulley of superior oblique.
 P External rectus.
 R Internal rectus.
 S Placed in frontal sinus just in front of the infundibulum.
 T Orbital plate of frontal bone.</p> |
|---|---|

VESSELS

<p>a Internal carotid.
 b Middle cerebral.
 c Anterior cerebral.
 d Anterior communicating.
 e Posterior communicating.
 f Vertebral.
 g Basilar.
 h Posterior cerebral.
 i Posterior superior cerebellar.
 k Posterior choroid.
 l Anterior cerebellar.
 m Leash of arteries going to posterior perforated space.</p> | <p>n Inferior cerebellar.
 o Ophthalmic.
 p Supra-orbital.
 r Lachrymal.
 s Posterior ethmoidal.
 t Anterior ethmoidal.
 v Frontal.
 x Long ciliary.
 y Short ciliary.
 z Lateral sinus.
 * Superior longitudinal sinus.
 † Inferior longitudinal sinus.</p> |
|--|--|

NERVES

<p>1 Optic tract.
 2 Optic commissure.
 3 Optic nerve.
 4 Third nerve.
 5 Sixth nerve.
 6 Frontal branch of ophthalmic division of fifth.
 7 Supra-orbital.
 8 Supra-trochlear.</p> | <p>9 Fourth nerve.
 10 Nasal branch of the first division of fifth.
 11 Infra-trochlear branch of the nasal.
 12 Long ciliary branch of the nasal.
 13 Ciliary branches from the lenticular ganglion.
 14 Lachrymal nerve.</p> |
|---|--|

One of the small transverse branches coming off from the basilar usually accompanies the auditory nerve into its internal auditory meatus, and is called the auditory artery.

PLATE XLIX. NATURAL SIZE.

INTERIOR OF SKULL WITH TENTORIUM REMOVED AND DEEP VIEW OF ORBITS, GASSERIAN GANGLION, AND PTERYGOID REGION FROM ABOVE.

This dissection is a deeper one on the same body as the preceding, only the tentorium has been completely removed and the lateral sinus opened up in the whole of its course. The dura mater of the middle fossa forming the roof of Meckel's space has been turned back to expose the Gasserian ganglion. On the right side the floor and side of the middle fossa has been cut away to expose the external pterygoid muscle from above with the course of the masseteric and deep temporal nerves.

The lateral sinuses, if examined, will be found to be unequal in size, the right being usually the larger; it generally receives the blood from the superior longitudinal sinus, *i.e.* the chief part of the blood from the surface of the brain, while the left and smaller usually receives the straight sinus, which again takes the blood from the central ganglia. In the early foetal condition the lateral sinuses empty chiefly into the external jugular through the mastoid foramen, but as development proceeds this gradually lessens, the internal jugular becoming developed as the chief means of exit.

The **Emissary** veins are those which communicate through apertures in the skull both with the veins within and those without. The chief are:

1. Through the foramen cecum between the superior longitudinal sinus and veins of the nose; this is often obliterated in adults.

2. Through the parietal foramen between the superior longitudinal sinus and veins of the scalp.

3. Through the occipital protuberance between the Torcular Herophili and the occipital vein.

4. Through the mastoid foramen between the lateral sinus and posterior external jugular.

5. Through the posterior condyloid between the lateral sinus and posterior vertebral vein.

6. Through the anterior condyloid between the occipital sinus and the deep veins of the neck.

7. Through foramen Vesalii or foramen ovale, between the cavernous sinus and the veins of the pterygoid plexus.

8. Through small veins around the carotid artery the cavernous plexus communicates with the internal jugular.

9. Although hardly an emissary vein, a communication exists between the ophthalmic vein and the angular, thus connecting the cavernous sinus with the facial vein.

10. A communication exists between the occipital sinus and the posterior spinal veins; this again is barely an emissary vein in the correct sense of the term.

11. A communication exists between the cavernous sinus and the veins outside the base of the skull through the foramen lacerum medium.

12. A pair of veins usually pass through the foramen spinosum to communicate between the meningeal veins and the veins of the exterior.

13. There is sometimes a vein passing through the foramen rotundum.

PLATE XLIX.

MUSCLES AND FASCIÆ

<p>A Cut edge of tentorium.
 B Cut edge of falx cerebri.
 C Falx cerebelli.
 D Dura mater bridging over the fifth nerve and entering into the roof of Meckel's cave.
 E Placed over the dorsum sellæ.
 G Anterior extremity of the falx cerebri attached to crista galli.
 H Superior oblique.
 H' Tendon of superior oblique.
 I Internal rectus.
 K Inferior rectus.
 L External rectus.
 M Superior rectus.</p> | <p>N Levator palpebræ.
 O Lachrymal gland.
 P Inferior oblique.
 R Inner surface of the temporal muscle.
 S External pterygoid.
 T Top of the interarticular cartilage of the temporo-maxillary joint.
 V Top of condyle of the lower jaw.
 W Anterior clinoid process.
 X Placed by the foramen ovale.
 Y Placed by the foramen rotundum.
 Z The roof of the optic foramen turned inwards with the origins of the levator palpebræ and superior rectus.</p> |
|--|--|

VESSELS

<p>a Internal carotid.
 b Internal carotid in cavernous sinus.
 c Ophthalmic artery.
 d Lachrymal artery.
 e Recurrent branch of lachrymal to middle
 f Ciliary arteries. [fossa
 g Ophthalmic artery.
 h Anterior ethmoidal.
 i Infra-orbital branch of internal maxillary.
 k Deep temporal branch of internal maxillary.</p> | <p>l Middle meningeal.
 m Its anterior division.
 n Its posterior division.
 o Its petrosal branch.
 p Ganglionic branch of internal carotid.
 r Vertebrales.
 s Posterior cerebellar.
 t Commencement of superior longitudinal sinus.
 u End of superior longitudinal sinus.
 v End of straight sinus.
 w Lateral sinus laid open.</p> |
|---|---|

NERVES

<p>1 Infundibulum leading through dura mater to pituitary body.
 2 Optic nerve.
 3 Third nerve.
 4 Upper division of third supplying levator palpebræ and superior rectus.
 5 Nerve to the inferior oblique from inferior division of third nerve.
 6 Branch of third to inferior rectus.
 7 Fourth nerve.
 8 Sixth nerve
 9 Fifth nerve just before passing over the superior border of the petrosal bone.
 10 Gasserian ganglion.
 11 Third division of fifth.
 12 Second division of fifth.
 13 First or ophthalmic division of fifth.
 14 Frontal and nasal branches of first division of fifth cut (left side).
 15 Frontal branch of ophthalmic cut (right side).
 16 Nasal branch of ophthalmic.
 17 Lachrymal branch of ophthalmic.</p> | <p>18 Lenticular ganglion, entering the back of which is the ganglionic branch of the nasal.
 19 Long ciliary branch of nasal.
 20 Infra-trochlear branch of nasal.
 21 Ciliary branches of the lenticular ganglion.
 22 Deep temporal branches of third division of fifth.
 23 Masseteric branch of same.
 24 Pterygoid and buccal branches of same.
 25 Great superficial petrosal.
 26 Lesser superficial petrosal.
 27 External petrosal.
 28 Seventh or portio dura.
 29 Pars intermedia.
 30 Auditory or portio mollis.
 31 Glosso-pharyngeal.
 32 Vagus.
 33 Spinal portion of spinal accessory.
 34 Hypoglossal.
 35 Infra-orbital from second division of fifth.</p> |
|---|---|

PLATE L. NATURAL SIZE.

THE PHARYNX FROM BEHIND.

In this dissection the anterior portion of the skull was detached from the posterior by means of two saw cuts, beginning behind the mastoid process and running parallel with the petrous portion of the temporal bone and passing through the posterior wall of the jugular foramen. The basilar process of the occipital bone was then broken through by a chisel cut and the anterior portion of the skull removed.

On the right side the various structures passing up to and from the base of the skull were left in their normal positions, while on the left the internal carotid, internal

jugular vein and sympathetic nerves were cut away to show the structures in front of them. The vagus and spinal accessory were cut and hooked aside and the digastric partly cut away.

A diagram has been introduced here to show the connections of the nerves with each other and the sympathetic as they leave the skull, the hypoglossal having been omitted for the sake of clearness. The distribution of the nerve of Jacobson is also indicated in a diagrammatic manner.

PLATE L.

MUSCLES

A Pharyngeal aponeurosis showing above the edge of the superior constrictor. This space is called the sinus of Morgagni. B Superior constrictor. C Middle constrictor. D Inferior constrictor. E Placed over the great cornua of the hyoid bone. F Oesophagus. G Trachea. H Thyroid gland. I Posterior belly of the digastric. K Stylo-hyoid. L Stylo-pharyngeus.	M Internal pterygoid. N Levator palati. O Masseter. P Sterno-mastoid. R Trachelo-mastoid and splenius turned back. S Parotid gland. T Submaxillary gland. U Posterior edge of ramus of jaw. V Base of styloid process. W Rectus capitis anticus major. X Rectus capitis anticus minor. Y Basilar process of the occipital bone. Z Jugular fossa. * Digastric fossa.

VESSELS

a Common carotid. b Internal carotid. c External carotid. d Facial. e Submaxillary branch of facial. f Superior thyroid. g Occipital. h Meningeal branch of the occipital ascending to pass through jugular foramen. i Sterno-mastoid twig of occipital. l Posterior auricular. m Stylo-mastoid branch of posterior auricular. n Ascending pharyngeal. o Meningeal branch of the ascending	pharyngeal passing through jugular foramen. p Pharyngeal branches of ascending pharyngeal. r Ascending palatine branch of facial. s Sterno-mastoid branch of superior thyroid. t Internal jugular vein. v Internal maxillary artery. w Inferior thyroid vessels. x Temporo-maxillary vein. y Posterior division of temporo-maxillary going to join external jugular. z Anterior division joining with the * Facial and emptying into the internal jugular.

NERVES

1 Glosso-pharyngeal. 2 Pharyngeal branches of glosso-pharyngeal. 3 Muscular twig to glosso-pharyngeus. 4 Pneumogastric. 5 Pharyngeal branches of vagus. 6 Superior laryngeal branch of vagus. 7 Internal laryngeal branch of vagus. 8 External laryngeal branch of vagus. 9 Pharyngeal twig from the external laryngeal. 10 Twigs to thyroid gland from external laryngeal. 11 Spinal accessory. 12 Accessory portion of spinal accessory joining the lower ganglion of vagus. 13 Hypoglossal. 14 Descendens noni (cervicis).	15 Superior cervical ganglion of sympathetic. 16 Pharyngeal branches from the sympathetic ganglion. 17 The ascending branches of the sympathetic splitting on the internal carotid to form the plexuses. 18 Lingual nerve. 19 Inferior dental. 20 Communication from first cervical to hypoglossal. 21 Sixth pair of nerves. 22 Seventh and eighth pair. 23 Fifth pair. 24 Fourth pair. 25 Facial nerve. 26 Recurrent laryngeal.

PLATE LI. NATURAL SIZE.

THE PHARYNX OPENED SHOWING PALATE, POSTERIOR NARES, &c.

In this dissection the constrictor muscles were divided along the median raphe and the pharyngeal aponeurosis partly detached from its upper attachment; the mucous membrane was carefully removed from the soft palate and pharynx. On the left side the posterior layer of the palato-pharyngeus was partially turned back, while on the right it was completely removed. The right levator palati was also divided, and the pharyngeal aponeurosis removed from the border of the pterygoid process, in order to expose the tensor palati.

The position of the tensor and levator palati muscles should be carefully studied, as they have to be divided in operations for cleft palate, because they are concerned in drawing apart the edges of the cleft; thus causing tension on the stitches when the edges are sutured together.

The enervation of the levator palati has given rise to much discussion, but Horsley and Beevor have discovered that stimulation of the facial within the skull produces no effect on the palate, while as soon as the eleventh nerve was stimulated, that side of the soft palate was at once raised. The nerve supply probably reaches it through the pharyngeal plexus.

In the early fœtus the anterior pillar of the fauces is a sharp fold bounding a deep recess which was the lower part of the second post-oral cleft; the tonsil is a mass of adenoid tissue developed in the cleft, and above it there is often a fossa—the supra-tonsillar fossa which is a permanent remains of the cleft. The posterior pillars of the fauces are developed later, and divide this pouch into the supra-tonsillar fossa and the lateral recess of the pharynx.

PLATE LI.

MUSCLES

<p>A Superior constrictor.
 B Posterior fasciculus of the palato-pharyngeus.
 C Anterior fasciculus of the palato-pharyngeus.
 D Azygos uvulæ.
 E Levator palati.
 F Tensor palati.
 G Aponeurosis of pharynx closing in sinus of Morgagni.
 H Cartilage of Eustachian tube.
 I Internal pterygoid plate.
 J Posterior nares.</p> | <p>K Internal pterygoid muscle.
 L External pterygoid muscle.
 M Osseous part of the Eustachian canal.
 N Placed over great cornua of hyoid bone.
 O Placed over the superior cornua of thyroid cartilage.
 P Placed on tongue below foramen cæcum.
 R Epiglottis.
 S Glosso-epiglottidean pouches.
 T Oesophagus.</p> |
|---|--|

VESSELS

<p>a Internal carotid.
 b Internal maxillary.
 c Middle meningeal.</p> | <p>d Inferior dental.
 e Branch from the ascending palatine of facial.</p> |
|--|--|

NERVES

<p>1 Auriculo-temporal.
2 Inferior dental.</p>	3 Lingual.

A bristle has been passed through the right Eustachian canal.

PLATE LII.

THE LARYNX. NATURAL SIZE.

In this plate are represented three dissections of the larynx. Fig. I. shows a posterior view with the mucous membrane removed, to show the nerves and muscles; Fig. II. a side view, with the posterior part of the right side of the thyroid removed; and Fig. III. a deeper view of the same, to show the deep portion of the thyro-arytenoid muscle and its connection with the true vocal cords.

*Morphology of the Vocal Cords.*¹—Mr. Sutton has pointed out that the false vocal cords of man are connected in front with the inner surface of the thyroid cartilage, and also the base of the epiglottis; embedded in their substance are the cuneiform cartilages, and on tracing the false cords backwards to their attachment to the arytenoids, accessory slips will be found connecting them with the cornicula laryngis. In the porpoise there is an azygous epiglottis and an enormously prolonged cornicula laryngis which, though separate, are bound together by dense fibrous tissue. From the base of the epiglottis a process of cartilage projects which is joined by fibrous tissue with a style-like process of cartilage projecting from the cornicula laryngis; and in this fibrous tissue are nodules of cartilage. In the ant-eater there is a well-developed epiglottis, and directly continuous with its body is a process of cartilage which, passing backwards, becomes continuous with that overtopping the arytenoids; this body causes a projection in the mucous membrane and forms the false vocal cord. In the horse there is a thick bar of cartilage continuous with the base of the epiglottis projecting backwards into the false vocal cords.

Thus, in man the false vocal cords with the cuneiform cartilages are the degenerate representatives of the piece of cartilago by means of which the cornicula laryngis and the epiglottis were originally united, and, with the cornicula, must be regarded as vestigial structures.

The *True Cords* may be considered as the tendinous part of the thyro-arytenoid muscle, which is intimately connected with it.

The *Hyo-epiglottic Ligament*.—In the horse a muscle replaces this ligament, which has occasionally even in man been seen to be muscular. It attains its greatest development in those animals with an intra-narial epiglottis.

¹ Bland Sutton, *Journal of Anat. and Phys.* vol. xxiii. p. 256.

PLATE LII.

Fig. I. MUSCLES, &c.

<p>A Crico-arytenoideus posticus.
 B Crossing bands of arytenoideus.
 B' Aryteno-epiglottideus really formed by the crossed bands of the arytenoideus passing over the arytenoids into aryteno-epiglottidean fold.
 C Deeper transverse portion of the arytenoideus.
 D Origin of the anterior muscular band of œsophagus.
 E Upper border of cricoid cartilage.
 F Crico-thyroid joint.
 G Inferior cornua of thyroid.
 H Superior cornua of thyroid.</p> | <p>I Cartilago-triticea.
 K Cut edge of mucous membrane.
 L Fibres of the palato-pharyngeus.
 M Inferior constrictor.
 N Lateral glosso-epiglottidean bands.
 O Tonsils.
 P Epiglottis.
 R Placed on the root of tongue just below foramen cœcum.
 S Thyro-hyoid membrane.
 T Placed over the great cornua of the hyoid bone.
 U Thyroid gland.
 V Posterior portion of trachea.</p> |
|--|--|

Fig. II. MUSCLES

<p>A Arytenoideus.
 B Aryteno-epiglottideus.
 C Arytenoideus posticus.
 D Origin of the anterior muscular band of œsophagus.
 E Crico-thyroideus.
 F Arytenoideus lateralis.
 G G' Superficial fibres of the thyro-arytenoideus.
 H Deep portion of the thyro-arytenoideus.
 I Thyro-hyoid membrane.
 J Right ala of thyroid cartilage.</p> | <p>K Great cornua of the hyoid bone.
 L Superior cornua of the thyroid cartilage.
 M Thyro-hyoid and sterno-hyoid muscles.
 O Hyoglossus.
 P Articular facet for thyroid on cricoid cartilage.
 R Articular facet for cricoid on thyroid cartilage.
 S Thyroid gland.
 T Trachea.
 V First ring of trachea.
 Z Suspensory ligament of thyroid.</p> |
|---|--|

Fig. III. MUSCLES

<p>A Thyroid cartilage.
 B Cricoid cartilage.
 C Crico-thyroid membrane.
 D Articular facet for thyroid cartilage.
 E Arytenoideus posticus.
 F Arytenoideus lateralis.
 G Deep portion of the thyro-arytenoideus.
 H True vocal cords, a cut edge of the</p> | <p>mucous membrane overlapping the right.
 I False vocal cord.
 K Arytenoid cartilage.
 L Arytenoideus.
 M Ventricle of the larynx.
 N Placed over the processus vocalis.
 O Median glosso-epiglottic fold.
 P Epiglottis.</p> |
|---|--|

VESSELS

<p>a Inferior thyroid artery.
b A laryngeal branch of inferior thyroid.</p>	c Superior laryngeal.

NERVES

<p>1 Recurrent laryngeal.
 2 Branch to inferior constrictor.
 3 Branch of communication with superior laryngeal.
 4 Branch to arytenoideus.</p> | <p>5 Branch to arytenoideus lateralis and thyro-arytenoideus.
 6 Branch to arytenoideus posticus.
 7 Superior laryngeal.</p> |
|---|--|

Fig. I.

Fig. III.

Fig. II.

PLATE LIII.

SAGITTAL SECTION OF THE HEAD.

The so-called fourth meatus of the nose, *i.e.* the space between the upper turbinal bone and the roof of the nose, was very shallow, and is chiefly hidden by the projecting part of the anterior surface of the body of the sphenoid.

The lateral recesses of the pharynx, I, are the remains of the dorsal end of the second post-oral visceral pouches which never perforate in the normal human embryo.

The dissection illustrated in this plate is one which Mr. Sutton made without freezing for the Middlesex Hospital Museum; several were cut before as good a one as this resulted. (I intended to have made an original dissection, but there was no possibility of obtaining fresh enough material; nor even sufficiently fresh to make a dissection for the topography of the brain)

PLATE LIII.

MUSCLES, &c.

A Falx cerebri.
 B Tentorium cerebelli.
 C Falx cerebelli.
 D Frontal sinus.
 E Superior turbinal bone.
 F Middle turbinal.
 G Inferior turbinal.
 H Hard palate.
 I Lateral recess of pharynx.
 J Opening of the Eustachian tube.
 K Soft palate.
 L Genio-hyo-glossus muscle.
 M Sublingual gland.

N Genio-hyoid.
 O Hyoid bone.
 P Placed in pharynx opposite the tip of the epiglottis.
 R Laryngeal surface of epiglottis.
 S Placed on the arytenoid cartilage.
 T Section of thyroid cartilage.
 U Sphenoidal sinus.
 V Basilar process of occipital.
 X Bursa between odontoid process and atlas.

The vertebræ are numbered in Roman numerals.

VESSELS

a Inferior longitudinal sinus.
 b Veins of Galen.
 c Straight sinus.
 d Superior longitudinal sinus.

e Vertebral artery just at its junction with the one on the opposite side to form the basilar.
 f Anterior cerebral.

NERVES

1 Corpus callosum.
 2 Genu of corpus callosum.
 3 Splenial end of corpus callosum.
 4 Septum lucidum.
 6 Anterior commissure of the third ventricle.
 7 Optic thalamus.
 8 Infundibulum.
 9 Pituitary body.
 10 Pineal body.
 11 Corpora quadrigemina.

12 Aqueduct of Sylvius.
 13 Valve of Vieussens.
 14 Pons.
 15 Placed in the fourth ventricle.
 16 Convolution of the corpus callosum (gyrus fornicatus).
 17 Supra-marginal convolution.
 18 Calloso-marginal fissure.
 19 So-called *ventricle* of the corpus callosum.

PLATE LIV.

FIRST ANTERIOR VIEW OF THE THORAX.

This plate shows the thorax, with the sternum, costal cartilages, and the anterior extremity of the ribs removed. Great care was taken not to open the pleural sacs and to preserve them in their normal position. The sternum and ribs were drawn first before removal, and the outline has been traced in white lines over the plate so as to show at a glance the relations of the various structures to the anterior wall of the thorax. The following diagram has been introduced to show the surface marking of the viscera.

Note on the Pleura.—Luschka states that the inner edge of the left pleura diverges normally from the sternum opposite the upper border of the fifth cartilage and at the level of the sternal end of the fifth rib is about half an inch from the edge of the sternum, while at the level of the sternal end of the seventh rib it has receded nearly one and a half inches from the edge of the sternum. St. John Brooks, on the other hand, after a careful investigation, has shown that this is not the case, but that both pleurae descend under the cover of the sternum as far as the seventh costal cartilage, and thus in some cases of paracentesis of the pericardium the pleura may be perforated, though in others probably the distension of the pericardium has pushed away the pleura from its loose attachment to the anterior walls.

PLATE LIV.

MUSCLES

A Pericardium.	F Scalenus medius.
B Pleural sacs.	G Trachea.
C Thyroid gland.	H Cricoid cartilage.
D Crico-thyroid muscles.	K Anterior mediastinal glands.
E Scalenus anticus.	

VESSELS

a Left innominate vein.	m Common carotid arteries.
b Right innominate vein.	n Subclavian arteries.
c Internal mammary veins.	o Inferior thyroid branches of subclavian
d Inferior thyroid veins.	p Transverse cervical.
e Subclavian vein.	r Supra-scapular.
f Internal jugular.	s Internal mammary.
g Middle thyroid vein.	t Anterior intercostal and perforating
h Mediastinal veins.	branches of internal mammary.
i Transverse aorta.	v Anterior mediastinal branches of in-
k Innominate artery.	ternal mammary.
l Arteria thyroidea ima.	

NERVES

1 Right pneumogastric.	3 Cords of brachial plexus.
2 Phrenics.	

Mr. Tredgold draws the following conclusions from a close investigation of the ribs of ten genera of primates: (1) that there is a gradual but marked reduction in the total number as we rise in the scale; (2) that there is a coincident and proportionate reduction in the number of the sternal ribs, and (3) that the 8th rib tends to change from a sternal to a costal one, and consequently (4) the thoracic cavity is shortened, but the capacity is compensated by an increase in breadth.¹

¹ *Journal of Anatomy and Physiology*, vol. xxx. p. 239.

PLATE LV.

SECOND ANTERIOR VIEW OF THORAX.

In this plate the lungs have been drawn aside to uncover the pericardium; this has been opened to show the position of the heart and great vessels.

Aeby¹ opposes the idea that the bronchi divide dichotomously as they pass into the lungs, and states that each tube passes in as an axial stem in the lung substance, giving off branches in definite directions. These branches can be divided into primary, and secondary or accessory branches which are probably only subdivisions of the primary that have become implanted on the axial trunks. The primary branches are in two sets: those given off in front of the pulmonary artery—*eparterial*; and those given off behind—*hyarterial*, the latter arise from the outer surface of the stem bronchus and pass in two directions, some ventrally and some dorsally. The pulmonary artery as it passes backwards lies on the outer surface of the axial bronchus, between the two sets. Small and more irregular branches arise on the inner surface of the axial bronchus; these are the accessory bronchi. Thus the arrangement is more bipinnate than dichotomous.

If the human bronchi be examined it will be seen that the right one gives off a branch *above*² the place where the pulmonary artery crosses it, this is not represented on the left side, it is the *eparterial* bronchus: and thus Aebý supposes that the lobe of the lung to which it is distributed is also absent on the left side, and that the middle lobe of the right lung represents the whole of the upper lobe on the left; for all the rest of the bronchi come off *below* the crossing of the pulmonary artery, and hence are *hyarterial*. His has shown that in the development of the human lung, the right bronchus possesses at first only two buds which correspond to the *eparterial* and first ventral *hyarterial* bronchi; while the left bronchus has but one such bud, which corresponds to the first ventral *hyarterial* bronchus. The branching on the left side is more profuse than on the right, an especially strong dorsal branch being given off which runs upwards. This is unrepresented on the right side and compensates for the loss of the *eparterial* bronchus. In the sheep and ox the *eparterial* bronchus of the right upper lobe springs from the trachea, and this condition has been met with in the human subject. In some animals *eparterial* branches spring from both bronchi and supply corresponding lobes in the two lungs.

¹ Aebý, *Der Bronchialbaum der Säugethiere und des Menschen*. Leipzig, 1887.

² In quadrupeds the term *in front of the pulmonary artery* corresponds to *above* in the human subject, and *behind* to *below*.

PLATE LV.

MUSCLES

A The heart.
 B Right auricular appendix.
 C Left auricular appendix.
 D Pericardium.
 E Diaphragm.
 F Internal surface of the pleura.

G Thyroid gland.
 H Cricoid cartilage.
 K Crico-thyroid muscle.
 L Scalenus anticus.
 M Trachea.

VESSELS

a Ascending part of aortic arch.
b Transverse part of arch.
c Innominate artery.
d Right common carotid.
e Right subclavian.
f Left common carotid.
g Left subclavian.
h Thyroid axis.
i Supra-scapular.
k Transverse cervical.
l Inferior thyroid.
m Internal mammary.
n Pulmonary artery.

n' Ductus arteriosus.
o Superior vena cava.
p Left innominate vein.
r Right innominate vein.
s Internal jugular vein.
t Subclavian veins.
v Vertebral artery.
x Inferior thyroid vein.
y Middle thyroid vein.
z Left superior intercostal vein.
 * Pulmonary vein.
 † Vertebral vein.

NERVES

1 Phrenic.
 2 Vagus.
 3 Left recurrent laryngeal.
 4 Thoracic cardiac from vagus.

5 Inferior cervical cardiac of sympathetic of left side.
 6 Right cervical cardiac of the sympathetic.

PLATE LVI.

THE POSTERIOR VIEW OF THORAX.

In this dissection the whole of the vertebræ were removed, also the ribs as far as their angles. The body had not been dissected from the front of the thorax, so that everything is nearly in its normal position; save that, owing to the removal of the connecting vertebræ, the space has been elongated by the weight of the abdomen and head and neck dragging in opposite directions over the blocks on which the trunk was supported. The obliquity of the higher aortic intercostals is also well shown; these in the early fœtus come off at right angles to the aorta, and it is only after the first year of birth that the obliquity makes its appearance.

The posterior mediastinum includes that portion of the interpleural space behind the pericardium and below the level of the fourth dorsal vertebra. It is bounded

In front, by the pericardium;

Behind, by the bodies of the vertebræ; and

Above, by a plane passing through the joint of the manubrium and gladiolus sterni and the lower part of fourth dorsal vertebra.

Below, by the diaphragm.

Contents.—Descending part of aortic arch and thoracic aorta; origin of the aortic intercostals; azygos major, minor, and left upper azygos veins.

Œsophagus and thoracic duct.

Posterior mediastinal glands.

Vagi and plexus gulæ.

Professor Macalister limits the term 'aortic arch' to the transverse portion of the aorta as the ascending portion belongs to the ventral, and the descending portion to the dorsal or thoracic aorta.

PLATE LVI.

STRUCTURES

A Posterior portion of the parietal layer of pleura. B Esophagus. C Trachea. D Right bronchus. E Left bronchus. F Thoracic duct. G Posterior wall of pericardium, the left pleura being slightly retracted in order to expose more of it.	H External intercostal muscles. † Posterior mediastinal lymphatic glands. <i>Note.</i>—The ribs on both sides are numbered in Roman figures.

VESSELS

<i>a</i> Placed on thoracic aorta. <i>b</i> End of transverse portion of aortic arch (placed about the position of). <i>c</i> Left subclavian artery. <i>d</i> Superior intercostal branch of subclavian. <i>e</i> Profunda cervicis, a branch of superior intercostal. <i>f</i> Anastomosis between superior and first aortic intercostal.	<i>g</i> Aortic intercostals. <i>h</i> Bronchial arteries which on both sides were given off from the superior intercostals. <i>i</i> Azygos major vein. <i>k</i> Azygos minor vein. <i>l</i> Left upper azygos vein. <i>m</i> Superior intercostal vein of right side. <i>n</i> Superior intercostal vein of left side. <i>o</i> Intercostal veins.

NERVES

1 First dorsal nerve. 2 Its intercostal branch. 3 Main trunk of sympathetic. 4 Communication between first dorsal and first dorsal ganglion. 5 Great splanchnic.	6 Roots of great splanchnic from the dorsal ganglia, commencing in this case at the sixth. 7 Right vagus passing down to gain esophagus and break up into the plexus gulæ.

PLATE LVII.

THE FRONT OF THE NECK AND THORAX OF A NEARLY FULL-TERM FŒTUS.

In this plate the anterior view of a nearly full-term fœtus is shown. The front of the thorax was removed to show the relations of the thymus gland, and the position of the lungs when not expanded.

The ligament of the thymus gland, which was described by the late Mr. Arthur Hensman in Morris's 'Anatomy,' is only present on one side, but it shows in its centre a slight bulging which encloses a small isolated mass of gland structure, such as is often found in it. Very often the ligament is present on both sides, the thymus gland being thus tied up to the lower border of the thyroid gland. The thymus is developed in the fœtus as a bilateral tubular prolongation of the third visceral cleft, which grows down along the side and front of the trachea to join the fellow of the opposite side and so form a median organ. It also receives a portion of the epithelium from the fourth visceral cleft.

The *thyroid* gland is developed from two sources, the lateral lobes as diverticula from the fourth visceral clefts, while the median lobe or isthmus is a median diverticulum from the pharyngeal hypoblast opposite the second visceral arch, which grows down the front of the trachea and unites with the lateral lobes. This remains in the fœtus for some time as the thyreoglossal duct, opening on the surface of the tongue in the foramen cæcum. If, as occasionally happens, the upper part remains pervious, it is called the lingual duct. In the lower part the pyramidal middle portion or isthmus of the gland is developed, which is usually attached by a fibrous cord to the thyroid cartilage or thyro-hyoid ligament, and is called the ligament of the thyroid gland.

This plate shows the relatively small space occupied by the lungs in the fœtal chest before inflation. In this condition they are of a uniform, firm texture throughout, and resemble in colour and structure the adult liver; pieces cut off and thrown into water sink. When, however, the lungs are inflated, either artificially or by the efforts of a newly born child to respire, they become inflated with air and are then buoyant in water; this is taken advantage of in medico-legal cases as a test to find out whether the child has breathed or not.

PLATE LVII.

MUSCLES

A Thymus gland.	N Raphe between mylo-hyoid muscles.
B Ligament of thymus suspending it to lower border of the thyroid.	O Sterno-hyoids.
C Pleural sacs.	P Genio-hyoid.
D Diaphragm.	R Submaxillary glands.
E Pericardium.	S Sterno-mastoid.
F Thyroid gland.	T Trapezius.
G Trachea.	U Levator anguli scapulæ.
H Œsophagus.	V Scalenus medius.
I Crico-thyroid.	X Scalenus anticus.
J Crico-thyroid membrane.	Y Subclavius.
K Cut end of sterno-thyroid.	Z Clavicle.
L Omo-hyoid.	* Pomum Adami.
M Digastric.	† Pectoralis major.
	‡ Platysma.

VESSELS

<i>a</i> Common carotid arterics.	<i>f</i> Subclavian artery.
<i>b</i> Internal jugular veins.	<i>g</i> Facial vein.
<i>c</i> Subclavian veins.	<i>h</i> Lingual artery.
<i>d</i> Right innominate.	<i>i</i> Superior thyroid.
<i>e</i> Left innominate.	

NERVES

1 Sympathetic. The number is placed on the first cervical ganglion.	5 Spinal accessory.
2 Vagus.	6 Descending branches of cervical plexus.
3 Phrenic.	7 Great auricular and superficial cervical, from the second and third cervical.
4 Cords of the brachial plexus.

PLATE LVIII.

THE ISCHIO-RECTAL FOSSA, AND SUPERFICIAL VIEW OF THE PERINEUM.

In this dissection the skin and superficial fascia have been removed, and the fossa emptied of its fat. On the right side, the fasciæ bounding it deeply have been left intact; while on the left side the anal fascia has been removed to expose the levator ani, and the obturator fascia cut into to show Alcock's canal, which contains the internal pudic vessels and nerve.

The deep layer of the superficial perineal fascia (Colles's fascia) has been left to show how it covers the superficial perineal muscles, turning round the transversus perinei to form the anterior boundary of the ischio-rectal fossa, and to join the anterior layer of the triangular ligament. Laterally it is attached to the lower border of the pubic and ischial rami as far as the tuber, and in front passes into the dartoid tissue of the scrotum, becoming continuous with the fascia of Scarpa. In the middle line a vertical septum descends to the bulb, completely dividing the space into two behind, but incomplete in front: hence in rupture of the urethra the urine must pass forwards towards the scrotum in order to gain the opposite side; it cannot pass back into the ischio-rectal fossa because the fascia of Colles joins the anterior layer of the triangular ligament. If the internal surface of the rami of the ischium and pubes be examined, it will be seen that the inner edge of their lower border turns somewhat inward, forming the inner margin of the tuber ischii; this is joined by another faint line which runs along the inner surface of the bone from the bottom of the symphysis pubis. The fascia of Colles (E) is attached to the former, while the latter receives the attachment of the anterior layer of the triangular ligament (F), the space between giving attachment to the crus (A), erector penis (B), and transversus perinei (C).

INNER VIEW OF PUBES AND ISCHIUM.

A, Crus penis; B, Erector penis; C, Transversus perinei; D, Compressor urethrae; E, Fascia of Colles; F, Anterior layer of triangular ligament. The dotted line shows about the position of the posterior layer of the triangular ligament.

The *ischio-rectal fossa* is bounded:—

In front.—By Colles's fascia turning over the transversus perinei to join the anterior layer of the triangular ligament.

Behind.—By the tip of the coccyx.

Externally.—By the tuber ischii and obturator fascia covering the obturator internus, edge of gluteus maximus, and great sacro-sciatic ligament.

Internally.—By the anal fascia covering the levator ani, and the external sphincter.

Contents.—Inferior hæmorrhoidal vessels and nerve which cross the space, superficial perineal vessels and nerve, the perineal branch of the fourth sacral, and the padding of fat.

The internal pudic vessels and nerve can be felt in the outer wall of the fossa running in the obturator fascia.

PLATE LVIII.

MUSCLES AND FASCIÆ

A	Placed on the tuber ischii.	E	Obturator fascia covering obturator internus.	K	Levator ani muscle.
B	Tip of the coccyx.	F	Anal fascia covering levator ani.	L	Alcock's canal.
C	Skin round the anus.	G	Edge of gluteus maximus.	M	Placed on Colles's fascia over erector penis.
D	Placed on Colles's fascia as it begins to turn round the transversus perinei.	H	External sphincter muscle.	N	Placed over the prominence of the bulb.

VESSELS

a	Internal pudic artery in Alcock's canal; on the opposite side it is seen just showing through the fascia.	b	Inferior hæmorrhoidal branches.	d	Superficial perineal artery.
		c	Cutaneous twigs from hæmorrhoidal to skin and fat over fossa.		

NERVES

1	Internal pudic nerve.	4	Perineal branch of fourth sacral supplying external sphincter.		anterior primary branches of 3rd and 4th or 4th sacral.
2	Inferior hæmorrhoidal branches.	5	Perforating cutaneous nerve from the	6	Twigs from the posterior primary branches of the sacral nerves.
3	Cutaneous twigs of hæmorrhoidal.

PLATE LIX.

THE SECOND VIEW OF THE PERINEUM.

In this dissection the deep layer of the superficial fascia (Colles's) has been removed to expose the structures lying between it and the anterior layer of the triangular ligament, while on the left side the crus and erector penis muscles have been cut through to expose completely the anterior layer of the ligament.

Between the fascia of Colles and the anterior layer of the triangular ligament the following structures are contained: the transversus perinei muscles behind; the crura and erector muscles along the rami; in the middle line the accelerator urinæ covering the bulbous portion of the corpus spongiosum; and the superficial perineal vessels and nerves.

The central fixed point of the perineum is situated about an inch in front of the anus, and is the meeting-place of the following structures: the transversus perinei, levator ani, accelerator urinæ, and sphincter ani muscles; the latter is the most superficial, and is attached about this point to the fascia of Colles and the subcutaneous tissue. This central point is important clinically, for a knife sunk in the centre line and carried a little backwards and upwards would open up the membranous urethra, and it is just behind this point that the knife is entered in perineal lithotomy.

The levator ani was primarily a depressor of the tail, but atrophy of that organ and the enlargement of the pelvic outlet have modified the muscle. Its hinder part, attached to the coccyx, is the coccygeus muscle, while the rest forms a diaphragm for the pelvic outlet. The superficial sphincter is also a subcaudal slip segmented from the levator (Macalister).

PLATE LIX.

MUSCLES AND FASCIÆ

A External sphincter.	I Fascia of Colles.
B Levator ani.	K Transversus perinei.
C Crus penis (corpus cavernosum).	L Anterior layer of the triangular ligament.
D The section of the left crus, at its origin from the ramus.	M The skin around anus.
E Erector penis.	N Placed on the anterior portion of the tuber ischii.
F Accelerator urinæ covering the bulb.	O Fascia lata covering the adductor muscles.
G Slips from the accelerator, which pass over crura and, expanding into an aponeurosis, meet on the dorsum of the penis over the dorsal vein.	P Gluteus maximus.
H Corpus spongiosum.	R Tip of coccyx.

VESSELS

<i>a</i> Inferior hæmorrhoidal branches of the internal pudic.	<i>b</i> Superficial perineal branches of the internal pudic.
<i>c</i> Transverse perineal artery.	

NERVES

1 Inferior hæmorrhoidal.	5 Muscular branches to accelerator urinæ and bulb.
2 Superficial perineal.	6 Inferior pudendal from small sciatic.
3 Muscular branch to the erector penis.	7 Perineal branch of the fourth sacral.
4 Muscular branch from superficial perineal to levator ani.	

Highley, del.

PLATE LX.

THE THIRD VIEW OF THE PERINEUM—PROSTATE AND VESICULÆ SEMINALES.

In this view of the perineum the accelerator urine has been divided along its central raphi and turned aside to expose the bulbous portion of the corpus spongiosum. The levator ani has been severed behind the central fixed point of the perineum, and the rectum pulled back to expose the prostate and base of bladder, with the vesiculæ seminales. The anterior layer of the triangular ligament was removed on the left side, to show the internal pudic artery and dorsal nerve of the penis.

The following structures are contained between the two layers of the triangular ligament :—

1. Dorsal nerve of penis, and twig to the bulb.
2. Internal pudic arteries, and arteries to the bulb.
3. Plexus of veins.
4. Deep transverse muscle.
5. Cowper's glands.
6. Membranous urethra.
7. Compressor urethrae.
8. Dorsal vein of penis.
9. Subpubic ligament.

Thus, in the dissection of the perineum the following alternating layers have been seen and divided :—

1. Fascia of Colles, or deep layer of the superficial fascia.
2. Superficial perineal muscles {
 - Erector penis.
 - Accelerator urine.
 - Transversus perinei.
3. Anterior layer of triangular ligament.
4. Compressor urethrae and deep transversus muscle.
5. Posterior layer of the triangular ligament.
6. Levator ani.
7. Capsule of prostate.

PLATE LX.

MUSCLES, &c.

<p>A Gluteus maximus.
 B External sphincter turned back.
 C Rectum.
 D Levator ani (the letter points to its cut edge).
 E Obturator fascia.
 F Recto-vesical fascia, which has been cut and turned back with the rectum.
 G Prostate gland.
 H Vesiculæ seminales.
 I Vasa deferentia.
 K Membranous portion of urethra.
 L Anterior layer of the triangular ligament.</p> | <p>M Bulbous portion of the corpus spongiosum.
 N Accelerator urinæ.
 N' The band of the accelerator which passes over the crus to be inserted into its fellow of the opposite side.
 O Corpora cavernosa (crura of the penis).
 P Origin of the crus penis from rami of the ischium to pubis.
 R Erector penis.
 S Deep transverse muscle running into
 T Compressor urethræ.
 V Fascia of Colles (deep layer of the superficial fascia).</p> |
|---|--|

VESSELS

a Internal pudic artery.	b Artery to the bulb.
c A twig from the inferior vesical.	

NERVE

- 1 Dorsal nerve of the penis.

PLATE LXI.—LXII.

SUPERFICIAL VIEW OF THE FRONT OF THE ABDOMEN.

This plate shows a dissection of the front of the abdomen: the left side after removal of the subcutaneous tissue; and the right with the external oblique divided longitudinally near the junction of muscle and aponeurosis, and the ends reflected to show the internal oblique. It also shows well the way in which the external oblique muscle arises from the ribs by means of serrations. The deep layer of the superficial fascia is thin and membranous, requiring great care in dissection to preserve it. It is called the fascia of Scarpa, and unlike the superficial layer, which is continuous with that of the limbs, it is bound down to the fascia lata along the line of Poupart's ligament, passing centrally into the dartoid tissue of the scrotum, becoming inseparable from it, and thence is continued into the deep layer of the superficial perineal fascia. Thus extravasation of urine can pass freely from the perineum into the scrotum and on to the abdomen, but is prevented from creeping down the legs.

The external abdominal ring is a triangular interval left between the fibres of the aponeurosis of the external oblique. The upper edge or pillar is sharp, and passes to its insertion in front of the body of the pubes; while the lower edge or pillar is rounded (it is the inner end of Poupart's ligament), and is attached to the spine of the pubes. The base of the triangle is formed by the outer part of the pubic crest. Through the ring issues the cord in the male, and the round ligament in the female.

The two pillars are bound together by the intercolumnar fascia, which also forms a covering to the cord and testis under the name of the external spermatic fascia.

NOTE.—In this diagram the artist has carried the outline of the splenic flexure too much to the left. On reference to the section given on page 126, it will be seen that the summit of the splenic flexure has been cut by the mid-Poupart perpendicular line.

PLATE LXI.-LXII.

MUSCLES, &c.

A Left external oblique.	F The upper pillar of the external abdominal ring.	N Linea semilunaris, which corresponds to the edge of the rectus.
A' Right external oblique reflected and showing origin from the ribs.	G Poupart's ligament.	O Lineæ transverse.
B Aponeurosis of left external oblique.	H Internal oblique.	P Linea alba.
C Intercolumnar fibres.	I Cremasteric muscular fibres.	R The ribs. They are numbered according to their position.
D Prolongation of the intercolumnar fibres or fascia upon the cord, and here called the external spermatic fascia.	K Digitations of the serratus magnus.	S Suspensory ligament of the penis.
E Placed over the spine of the pubes.	L Aponeurosis of the right external oblique, cut.	T Corpora cavernosa.
	M Anterior lamella of the aponeurosis of the internal oblique.	

VESSEL

a Cremasteric artery from the deep epigastric.

NERVES

1 Ilio-inguinal from the first lumbar.	3 Muscular branch to the external oblique.	4 Anterior branches from the lower dorsal nerves.
2 Ilio-hypogastric from the first lumbar.		

The rectus is a metamerised vertical muscle whose several bellies retain their separate innervation (Macalister), the bellies being divided off by the lineæ transverse, which are attached to the anterior sheath of the muscle, and penetrate more or less completely through, but are not attached to the posterior sheath. Each belly has its separate nerve-supply, the highest from the seventh and eighth intercostals, the next from the ninth, the next from the tenth and eleventh, and the lowest from the twelfth, which also supplies the pyramidalis.

In the Koala (a marsupial) the internal oblique has four or five well-marked fibrous septa in direct serial continuity with the ribs (Young).

PLATE LXIII.—LXIV.

DEEP VIEW OF THE FRONT OF THE ABDOMINAL WALL.

This plate represents a deeper dissection on the same body as the previous one. On the right side, the internal oblique has been divided external to the linea semilunaris to expose the transversalis; while on the left the anterior portion of the sheath of the rectus has been stripped off to expose it and the pyramidalis, the oblique and transversalis muscles being cut away to expose the fascia transversalis.

The pyramidalis is specially developed in those animals which possess a marsupial bone.

It will be noticed that the arching fibres of the transversalis springing from Poupart's ligament and passing inwards to join those of the internal oblique (forming the conjoined tendon), leave an oval space which is guarded only by the transversalis fascia. This space is crossed by the deep epigastric artery, and thus divided into two—(i) an external part, the internal abdominal ring; and (ii) an internal, the lower portion of Hesselbach's triangle: the latter is again crossed and strengthened by the obliterated hypogastric artery. Through the internal ring the cord or round ligament passes, and the **oblique form of inguinal hernia** descends when present, following the course of the cord along the inguinal canal, and issuing at the external abdominal ring. It would thus have the following coverings:—1. Peritoneum and subperitoneal tissue; 2. Infundibuliform process of the fascia transversalis; 3. Cremasteric fascia; 4. Inter-columnar fascia; 5. Subcutaneous tissue and skin.

It must be remembered that the testicle in its descent pushes before it a process of peritoneum, the lower part of which remains as the tunica vaginalis, while the upper portion usually becomes obliterated. Should the whole of this process remain unobliterated so that the tunica vaginalis communicates with the peritoneal cavity, the bowel may have to overcome only a slight constriction at the internal ring to at once slip into the canal and descend into the tunica vaginalis, lying in front of the testis—a *congenital hernia*; or should the opening be so small that only the peritoneal fluid can drain into it, this fluid collects in the tunica vaginalis and forms a *congenital hydrocele*. Again, the tunica vaginalis may be cut off from the upper part of the process, and this process remain unobliterated: then the gut may descend into it and form a *hernia into the funicular pouch of the peritoneum*, or an *infantile hernia*.

When the gut descends through the lower part of Hesselbach's triangle—the **direct form**—it may pass on either side of the obliterated hypogastric. If to the outer side—the most common form between it and the deep epigastric artery—it would receive the same coverings as in the oblique form, save that it would push the main part of the fascia transversalis as a covering in front of it instead of entering the infundibuliform prolongation of that fascia through the internal ring. The rarer form is when the gut comes through to the inner side of the obliterated hypogastric artery, and has to push before it or separate the fibres of the conjoined tendon which here strengthens the wall. It thus breaks through the wall opposite the external ring out of which it passes, and it has as coverings: 1. Peritoneum and subperitoneal tissue; 2. Fascia transversalis; 3. Conjoined tendon; 4. Inter-columnar fascia; 5. Skin and subcutaneous tissue.

PLATE LXIII.—LXIV.

MUSCLES, &c.

A External oblique.	F Edge of right rectus.	L Spine of pubes.
A' Origin of external oblique from ribs.	G Lineæ transverse.	M Suspensory ligament of the penis.
B Internal oblique.	H Pyramidalis.	N Upper pillar of the abdominal ring.
E' Placed in front of the conjoined tendon.	I Fascia transversalis.	O Vas deferens.
C Transversalis.	I' Placed on abdominal rings when the infundibuliform process of the fascia is given off.	P Poupart's ligament.
D Anterior portion of the sheath of rectus.	K Infundibuliform process of the transversalis fascia (the internal spermatic fascia).	S Iliacus muscle, the fascia iliaca being peeled back to expose it.
E Aponeurosis of the right external oblique.		T External intercostals.
F Rectus.		* Hesselbach's triangle.

VESSELS

a Deep epigastric vessels.	d Anterior branch of the deep circumflex iliac.
b Cremasteric branch of deep epigastric.	e Deep circumflex iliac.
c Spermatic.	f A branch of the superior epigastric.

NERVES

1 Anterior branches of lower intercostals.	3 External cutaneous.
2 Muscular branch to internal oblique.	4 Genital branch of genito-crunal.

Hesselbach's triangle extends about 2 inches above the pubic crest, and is $1\frac{1}{2}$ inch broad at its base, and is bounded —
Externally by the deep epigastric artery.
Internally by the outer edge of the rectus.

Below by Poupart's ligament and the external portion of pubic crest.

The **inguinal canal** extends between the abdominal rings; it is about $1\frac{3}{4}$ inch long in the adult, and has the following boundaries :—
In front.—External oblique, and internal tendon in inner half, and triangular ligament.

Behind.—Fascia transversalis, conjoined tendon in inner half, and triangular ligament.

Floor.—Poupart's ligament.

Roof.—Arching fibres of internal oblique. In the fetus, the two rings are more or less opposite and the canal is very short; but as the internal ring travels outwards with the growth of the body, so the canal lengthens. The internal abdominal ring is bounded on the outer side by the arching fibres of the transversalis, and on the inner by the deep epigastric artery.

PLATE LXV.

VISCERA, &c.

- A Left lobe of liver.
 B Right lobe of liver.
 C Gall-bladder.
 D Stomach.
 E Ascending colon.
 F Cæcum.
 G Transverse colon.
 H Sigmoid flexure.
 I Bladder.

- K Umbilicus.
 L Falciform ligament of the liver.
 M Round ligament, which lies in the free edge of the falciform, and is the remains of the obliterated umbilical vein.
 N Great omentum covering over the greater portion of the small intestines.

VESSELS

- a Deep epigastric arteries.
 b Gastric branches of the gastro-epiploics.

- c Omental branches of the gastro-epiploics.

Right.

Left.

PLATE LXVI.

SECOND VIEW OF THE ABDOMINAL VISCERA— MESENTERY, SUPERIOR MESENTERIC ARTERIES, &c.

In this view the transverse colon has been turned upwards with the omentum and fastened to the wall of the thorax. The anterior layer of mesentery was then dissected away to expose more fully the superior mesenteric vessels which lay between its folds, and the posterior layer of the transverse meso-colon also partially removed to expose the colica media artery and the lower edge of the pancreas.

The morphological ending of the superior mesenteric artery is opposite the vitello-intestinal duct (Meckel's diverticulum), to which it is always directed.

The following diagrams are sections of the abdomen and pelvis in the central line of the body, showing the reflections of the peritoneum, the cavity of the lesser sac being shaded.

PLATE LXVI.

VISCERA, &c.

A Cæcum. B Upper end of the ascending colon. C Transverse colon. D An appendix epiploica. E Great omentum. F Transverse meso-colon. The letter is placed on the posterior layer, formed by the greater sac of the peritoneum, which has been partly cut away to expose the artery. G Upper layer of the transverse meso-	colon, formed by the lesser sac of the peritoneum. H Mesentery. I Splenic flexure of the colon. K Second or descending portion of the duodenum. K' Third or transverse portion of the duodenum. L Pancreas. M Lower end of the ileum. N Small intestine.

VESSELS, &c.

<i>a</i> Superior mesenteric artery. <i>b</i> Superior mesenteric vein. <i>c</i> Meso-colic artery. <i>d</i> An accessory meso-colic.	<i>e</i> A common trunk of origin of the colica sinistra and ileo-colic. <i>f</i> Colica sinistra. <i>g</i> Ileo-colic. <i>h</i> Vasa intestini tenuis.

PLATE LXVII.

THE THIRD VIEW OF THE ABDOMINAL VISCERA.

In this plate the transverse colon has been cut away between the hepatic and splenic flexures. The stomach has been drawn forward to the thoracic wall, exposing its posterior surface. The small intestine has been removed with the mesentery, which has been cut short, and its anterior layer removed to expose the remains of the superior mesenteric vessels. Part of the posterior wall of the abdomen has been denuded of

peritoneum, to expose the aorta and inferior mesenteric vessels. The posterior layer of the lesser sac has also been reflected off the posterior wall of the abdomen to expose more of the body of the pancreas.

The accompanying diagrams were copied from Professor Cunningham's paper ¹ on the abdomen, to illustrate the varying relations of the duodenum and kidney due to the alteration in height of the latter.

¹ On reference to Professor Cunningham's *Manual of Practical Anatomy* I find the diagrams were drawn by Dr. St. John Brooks.

PLATE LXVII.

VISCERA

A	Posterior surface of the stomach.	L	Cæcum.
B	Cut edge of the great omentum.	M	Ascending colon.
C	Ascending or posterior layer of the lesser sac of the peritoneum.	N	Lower part of ileum.
D	Pancreas.	O	Vermiform appendix.
E	Second portion of the duodenum.	P	Splenic flexure of colon.
F	Third or transverse portion of the duodenum.	R	Descending colon.
G	So-called fourth portion of the duodenum ascending to end in	S	Sigmoid flexure of colon.
H	Jejunum.	T	First portion of rectum.
I	Right lobe of liver.	V	Bladder.
K	Gall-bladder.	W	Placed on the sacro-vertebral angle.
		X	Peritoneum covering the posterior abdominal wall.
		Y	Posterior layer of the mesentery.

VESSELS

<i>a</i>	Aorta.	<i>l</i>	Superior pancreatico-duodenal.
<i>b</i>	Common iliacs.	<i>m</i>	Inferior pancreatico-duodenal.
<i>c</i>	External iliac.	<i>n</i>	Colica dextra.
<i>d</i>	Inferior mesenteric.	<i>o</i>	Ileo-colic splitting into branches to
<i>e</i>	Colica sinistra.	<i>p</i>	The colon.
<i>f</i>	Superior hæmorrhoidal.	<i>r</i>	Ileum and cæcum.
<i>g</i>	Superior mesenteric.	<i>s</i>	Vasa intestini tenuis.
<i>h</i>	Colica media.	<i>t</i>	Superior mesenteric vein.
<i>i</i>	Gastro-duodenal.	<i>v</i>	Inferior mesenteric vein.
<i>k</i>	Gastro-epiploica dextra.	<i>x</i>	Sacra media.

PLATE LXVIII.

THE FOURTH VIEW OF THE ABDOMINAL VISCERA— PORTAL VEIN, PANCREAS AND SPLEEN, &c.

In this dissection the stomach, duodenum, and transverse colon were removed, and the liver stitched to the anterior wall to display the contents of the lesser omentum—viz. the common bile-duct, formed by the junction of the hepatic and cystic ducts, lying in front and to the right, the hepatic artery to the left and on a plane slightly posterior, the portal vein being seen behind and between the other two. The spleen has been left resting on the costo-colic ligament, a process of peritoneum which extends from the splenic flexure of the colon to the tenth and eleventh ribs.

The portal vein is about three inches long, and usually commences at the upper border of the pancreas by the junction of the superior mesenteric and splenic veins. In 66 per cent. of cases the inferior mesenteric joins the splenic, and in 33 per cent. it joins the superior mesenteric, while in the remaining 1 per cent. it runs into the junction of the two veins. The ending of the inferior mesenteric vein in the splenic appears to be a feature in the higher development of animals, as in all mammalia below monkeys it opens into the superior (Treves). The portal system has no valves, and communicates with the systemic venous system at

1. The rectum (superior with middle and inferior hæmorrhoidal).
2. The œsophagus (gastric with the œsophageal).
3. Small veins of duodenum and pancreas with the left renal.
4. The superficial portal capillaries and the capillaries in the falciform ligament of the liver with the phrenic veins.
5. Along the round ligament there are often one or more small veins which form a communication with the epigastric veins, and in certain diseased states of the liver are often much dilated. They are called the parumbilical veins, 'and may represent the anterior abdominal vein or suprahepatic termination of the hypoblastic vein' (Macalister).

PLATE LXVIII.

VISCERA, &c.

A Pancreas.	N Bladder.
B Spleen.	O Cut edge of posterior parietal layer of
C Right lobe of liver.	greater sac of peritoneum descending
D Left lobe of liver.	into pelvis.
E Quadrate lobe of liver.	P Kidneys.
F Ascending colon.	Q Ureter.
G Termination of ileum.	R Gall-bladder.
H Vermiform appendix.	S Cystic duct.
I Descending colon.	T Hepatic duct.
K Costo-colic ligament.	V Common bile-duct.
L Sigmoid flexure.	W Mesentery.
M Transverse colon (cut), just beyond	X Psoas.
hepatic flexure.	Y Diaphragm.

VESSELS

<i>a</i> Abdominal aorta.	<i>p</i> Colica media branch of <i>k</i> .
<i>b</i> Common iliac artery.	<i>q</i> Superior mesenteric vein.
<i>c</i> Vena cava inferior.	<i>r</i> Renal artery.
<i>d</i> Gastric artery (cut).	<i>s</i> Renal vein.
<i>e</i> Hepatic artery.	<i>t</i> Spermatic artery.
<i>f</i> Cystic branch of <i>e</i> .	<i>v</i> Right spermatic vein.
<i>g</i> Gastro-duodenal branch of <i>e</i> .	<i>w</i> Left spermatic vein.
<i>h</i> Portal vein.	<i>x</i> Inferior mesenteric artery.
<i>i</i> Splenic artery.	<i>y</i> Colica sinistra branch of <i>x</i> .
<i>k</i> Superior mesenteric artery.	<i>z</i> Sigmoid branches of <i>x</i> .
<i>m</i> Vasa intestini tenuis branches of <i>k</i> .	+ Superior hæmorrhoidal branch of <i>x</i> .
<i>n</i> Ileo-colic branch of <i>k</i> .	* Inferior mesenteric vein.
<i>o</i> Colica dextra branch of <i>k</i> .	+ Capsular vein.

NERVES

1 Left semilunar ganglion.	5 Left sympathetic trunk.
2 Hepatic plexus of sympathetic.	6 Inferior mesenteric plexus of sym-
3 Renal plexus of sympathetic.	pathetic.
4 Spermatic plexus of sympathetic.	7 Left splanchnic nerve.

PLATE LXIX.

POSTERIOR WALL OF ABDOMEN—KIDNEYS AND SPLEEN.

This plate is taken from the same body as the preceding. The pancreas, ascending and descending colon, sigmoid flexure, and the liver, excepting a small portion surrounding the vena cava, have been removed. Thus the kidneys, almost the entire length of the vena cava, and most of the branches of the abdominal aorta have been exposed.

The following diagram shows the anterior relations of the kidneys, but it should be borne in mind that these necessarily alter somewhat with each individual, according to the height of the kidney above the iliac crest, and therefore can only be taken as a mean.

The height of the lower edge of the kidneys above the iliac crest varies very considerably, but on the whole the left is usually placed a little higher than the right.

As the suprarenal bodies are not usually well seen in the dissecting-room, the accompanying diagrams taken from Dr. Rolleston's paper¹ illustrate their general form and relations.

¹ *Journal of Anat. and Phys.* vol. xxvi. p. 548.

PLATE LXIX.

VISCERA

A Diaphragm.	K Spleen.
B Psoas magnus.	L Kidney.
C Quadratus lumborum.	M Ureter.
D Transversalis.	N Bladder.
E Crest of ilium.	O Vas deferens.
F Iliacus.	P Oesophageal opening in diaphragm.
G Psoas parvus.	Q Diaphragm covering aorta and forming aortic tunnel.
H Fifth lumbar vertebra.	
I Remains of liver.	

VESSELS

a Abdominal aorta.	q Inferior mesenteric.
b Vena cava inferior.	r Sacra media.
c Right phrenic artery.	s Common iliac.
d Left phrenic artery.	t Internal iliac.
e Celiac axis.	u External iliac.
f Hepatic artery.	w Circumflex iliac.
g Gastric.	x Deep epigastric.
h Splenic.	y Left common iliac vein.
i Superior mesenteric.	z Right common iliac vein.
k Renal artery.	α Sacra media vein.
l Spermatic.	β Right spermatic vein.
m Abdominal branch of first lumbar artery.	γ Left spermatic vein.
p Iliac branch of ilio-lumbar.	δ Left renal vein.
	ε Right renal vein.

NERVES

1 Left semilunar ganglion.	10 Last dorsal nerve.
2 Part of right semilunar ganglion.	11 Placed between the iliac and hypogastric branches of the ilio-hypogastric.
3 Left great splanchnic.	12 Ilio-inguinal.
4 Left sympathetic trunk.	13 External cutaneous.
5 Solar plexus of the sympathetic.	14 Anterior crural.
6 Renal plexus of the sympathetic.	15 Muscular branch to iliacus.
7 Spermatic plexus of the sympathetic.	16 Genito-crural.
8 Aortic plexus of the sympathetic.	
9 Hypogastric plexus of the sympathetic.	
17 Right sympathetic trunk.	

Highley del.

PLATE LXX.

POSTERIOR WALL OF ABDOMEN—LUMBAR PLEXUS.

This dissection is a continuation of same subject as in the last plate. The inferior vena cava and the remains of the liver have been removed, exposing the right splanchnic nerve, semilunar ganglion, and crus of diaphragm; the lumbar arteries are seen coming off from the aorta. The kidney, psoas parvus, and magnus have been removed on the left side to allow the lumbar plexus to be dissected out. The communications with the sympathetic are well seen. The ilio-lumbar artery is given off from the common iliac instead of the posterior trunk of the internal iliac, and this mode of origin is by no means uncommon. On the left side the body of the pubes has been removed to expose the internal iliac vessels and their branches.

The following diagram shows a scheme of the lumbar plexus; the posterior divisions of the nerves have been shaded. The so-called accessory obturator would be better named 'accessory anterior crural,' (1) because in its origin it is more nearly allied to that nerve; (2) because of its course over the pubic ramus; (3) because it supplies a portion of the pectineus muscle in place of the anterior crural.

PLATE LXX.

MUSCLES

<p>A Diaphragm.
 B Quadratus lumborum.
 C Transversalis.
 D Right psoas.
 E Iliacus.
 F Crest of ilium.
 G Right crus of diaphragm.
 G' The origin of the right crus of the diaphragm from the anterior common ligament.
 H Placed over aortic tunnel.
 I Fifth lumbar vertebra (lower border).</p> | <p>K Poupart's ligament.
 L Opening in diaphragm for vena cava.
 M Oesophageal opening in diaphragm.
 N Bladder.
 O Spleen.
 P Right kidney.
 R Right ureter.
 S Right vas deferens.
 T Anterior common ligament. (The letter is placed over the disc between the third and fourth lumbar vertebræ.)</p> |
|---|--|

VESSELS

<p>a Aorta.
 b Commencement of inferior cava.
 c Common iliac artery.
 d Internal iliac artery.
 e External iliac artery.
 f Circumflex iliac artery.
 g Right common iliac vein.
 h Left common iliac vein.
 i External iliac vein.
 k Left internal iliac vein.
 l Right phrenic artery.
 m Left phrenic artery.
 n Celiac axis.
 o Gastric branch of celiac axis.
 p Hepatic branch of celiac axis.
 q Splenic branch of celiac axis.</p> | <p>r Superior mesenteric artery.
 s Renal arteries.
 t Spermatie artery.
 u, u₁, u₂, u₃, Lumbar arteries.
 w Inferior mesenteric artery.
 x Sacra media.
 y Left ilio-lumbar.
 z Iliac branch of right ilio-lumbar.
 α Obturator artery.
 β Internal pudic.
 γ Sciatic.
 δ Gluteal.
 ε Superior vesical.
 η Middle vesical.
 θ Lateral sacral.</p> |
|--|---|

NERVES

<p>1 Left semilunar ganglion.
 2 Right semilunar ganglion.
 3 Solar plexus of sympathetic.
 4 Upper part of aortic plexus of the sympathetic.
 5 Left great splanchnic.
 6 Right great splanchnic.
 7 Sympathetic trunk.
 8 Communication between the sympathetic and the lumbar nerves.</p> | <p>9 Last dorsal nerve.
 10 Placed between the iliac and hypogastric branches of ilio-hypogastric.
 11 Ilio-inguinal.
 12 Genito-crural.
 13 Anterior crural.
 14 Muscular branch to iliacus.
 15 External cutaneous.
 16 Obturator.
 17 Lumbo-sacral cord.
 18 Part of the sacral plexus.</p> |
|--|--|

PLATE LXXI.

FIRST SIDE VIEW OF A MALE PELVIS.

In the dissection represented in the plate the right innominate bone was sawn through the body of the pubis at the inner end of the thyroid foramen in order to save the attachment of the pelvic fascia. The bone was then disarticulated from the sacrum, the spine of the ischium being first severed at its base, and hooked up into position. Thus the attachments of the coccygeus and levator ani are preserved in their normal positions. The ischio-rectal fossa was then dissected from the side, and a part of the lateral wall of the bladder cleared to show the muscular coat. The so-called white line of the pelvic fascia is not clearly shown. It extends from the spine of the ischium to the body of the pubes, and is supposed to mark the limit of origin of the levator ani; but the fibres of this muscle often separate the obturator from the recto-vesical fascia higher than this line.

The plate also shows how, by distending the rectum and then inflating the bladder, the anterior non-peritoneal surface of the latter is brought into contact with the abdominal wall, and the peritoneum carried upwards. This fact is taken advantage of in doing a suprapubic lithotomy.

The tissue between the bladder and posterior surface of the pubes is very lax, and can be easily broken down by the finger, leaving a cavity, the space of Retzius. According to Braunné, the transversalis fascia splits at the umbilicus, one layer following the urachus down to the bladder, and the other passing over the abdominal wall to the back of the pubes; and it is the interval between these layers that forms the space above mentioned, and it is into this space that the bladder rises when distended. In the fetus the bladder lies against the abdominal wall, and 'in the deficient wall of the rectal sheath we have a trace of the original situation of the viscus, the upper border of which is marked by the semilunar line of Douglas' (Macalister).

In a male child at birth the urethra enters the bladder opposite the upper border of the symphysis, and the bladder occupies the lower two-thirds of the space between umbilicus and pubes. The peritoneum extends far more to the base of the bladder than in the adult, and this may account for the fact that in children the main cause of death after perineal lithotomy is due to injury of this membrane.

PLATE LXXI.

VISCERA, &c.

A Pelvic fascis.	O Corpus spongiosum.
B Obturator fascia.	P Suspensory ligament of penis.
C Placed below Alcock's canal for the internal vessels and nerve.	R Origin of adductor longus.
D Levator ani covered by anal fascia.	S Origin of adductores brevis and magnus.
E Sphincter ani.	T Origin of obturator externus.
F Coccygeus.	U Origin of obturator internus.
G Spine of ischium.	V Muscular coat of bladder.
H Section of body of the pubes.	W Placed on the lateral surface of bladder where it is covered by peritoneum.
K Section of descending ramus of the pubes.	X Vas deferens.
L Corpus cavernosum.	Y Ureter.
L' Origin of corpus cavernosum from the ramus of ischium (crus penis).	Z Placed on the loose cellular tissue covering the anterior surface of the bladder.
M Erector penis.	* Urachus.
N Accelerator urinæ.	

VESSELS

a Aorta.	k Sciatic.
b Inferior vena cava.	l Internal pudic.
c Right common iliac.	m Inferior hæmorrhoidal.
d Left common iliac.	n Dorsal artery of the penis.
e Lumbar arteries.	o Superficial perineal.
f Sacra media.	p Obturator artery.
g Right external iliac.	r Superior vesical.
h Right internal iliac.	s Obliterated hypogastric.
i Gluteal.	t Inferior vesical.
	u Superior hæmorrhoidal.

NERVES

1 Lumbo-sacral cord.	8 Inferior hæmorrhoidal.
2 First	9 Superficial perineal.
3 Second	10 Dorsal nerve of penis.
4 Third	11 Perineal branch of fourth sacral.
5 Great sacro-sciatic.	12 Accessory twig from fourth sacral to skin.
6 Small sacro-sciatic.	
7 Internal pudic.

PLATE LXXII.

SECOND SIDE VIEW OF A MALE PELVIS.

In this dissection, which is a continuation of that represented in the previous plate, the spine of the ischium has been turned down with the coccygeus muscle, and the levator ani separated from the spine and also turned down, being cut away from its attachment to the pubes. The capsule of the prostate has been opened to expose the gland. Fig. II. shows a side view of the levator ani muscle.

The accompanying diagram has been introduced to show the reflections of the pelvic fascia. The plane of section passes from the anterior superior iliac spine through the anus. The so-called white line in the diagram has been shown as the point of

splitting of the obturator from the recto-vesical fascia, although the levator ani often by its higher origin splits the two fasciæ farther up. It also shows clearly how the ischio-rectal fossa is bounded on the sides by the obturator and anal fasciæ.

Dr. Symington,¹ in making frozen sections of the pelvis, has proved that the usual description of the last part of the rectum is incorrect. He finds, 1st, that the second portion of the rectum is sacculated, and not a cylinder—the valves of Houston being situated between the sacculi—and that there is a slight *cul-de-sac* in the rectum just as it turns down to the anus, even when empty.

2nd (Third portion).—The anus or anal passage is one inch in length, and has its lateral walls in contact save during defæcation; it is, in fact, an antero-posterior slit.

¹ Dr. Symington, *Journal of Anatomy and Physiology*, vol. xxiii. p. 100.

PLATE LXXII.

MUSCLES, VISCERA, &c.

A Bladder.	R Compressor urethræ.
B Urachus.	S Deep layer of the superficial perineal fascia. (Anterior layer of triangular ligament.)
C Vas deferens.	T Transversus perinei.
D Vesiculæ seminales.	U Accelerator urinæ.
E Ureter.	V Crus penis (corpus cavernosum).
F Peritoneum.	X Erector penis.
G Lateral true ligament of bladder.	Y Suspensory ligament of penis.
H Prostate.	Z Origin of adductor longus.
K Rectum, second portion.	* Origin of adductors and obturator from pubes.
L First portion of the rectum.	† Bulbous portion of corpus spongiosum.
M Recto-vesical fascia.	
O Coccygeus muscle.	
P Levator ani.	

VESSELS

a Aorta.	i Rectal.
b Common iliacs.	k Superior vesical.
c External iliac.	l Obliterated hypogastric.
d Internal iliac.	m Inferior vesical.
e Sacra media.	n Inferior vena cava.
f Gluteal.	o Common iliac veins.
g Sciatic.	p Dorsal vein of penis.
h Internal pudic.	

FIG. 2.

A Spine of ischium.	E Coccyx.
B Body of pubes.	F Levator ani.
C White line at the point of splitting of the pelvic fascia.	G Obturator fascia, forming the posterior layer of the triangular ligament from which levator ani arises.
D Coccygeus.

PLATE LXXIII.

SIDE VIEW OF THE FEMALE PELVIS.

This plate was drawn from a dissection of the female pelvis after removal of the innominate bone. The left os innominatum was disarticulated from the sacrum and sawn through the body in front just internal to the obturator foramen; the spine of the ischium having been first removed to preserve the coccygeus muscle. The levator ani and coccygeus muscles were then turned down, and the recto-vesical fascia partly dissected away to expose the rectum and vagina.

The accompanying diagram shows a posterior view of the uterus and broad ligaments; on the left side the ovary is represented in its natural position, while on the right the ligament is stretched out to show the paroöphoron (organ of Rosenmüller).

The following structures are contained between the layers of the broad ligament.

1. Fallopian tube.	6. Remains of Gaertner's duct.
2. Round ligament.	7. Uterine artery and veins.
3. Ligament of ovary.	8. Ovarian artery and veins.
4. Ovary.	9. Lymphatics.
5. Paroöphoron.	10. Sympathetic nerves.

PLATE LXXIII.

VISCERA, &c.

A Bladder.	M Lateral true ligament of bladder.
B Urethra.	N Levator ani.
C Meatus urinarius.	O Coccygeus.
D Vagina.	P Pyriformis.
E Uterus.	R Psoas.
F Fallopian tube forming upper edge of broad ligament.	S Auricular articular surface of sacrum.
G Round ligament.	T Cæcum.
H Uroter.	V Vermiform appendix.
K Rectum, first portion.	Y Clitoris.
K' Second portion of rectum.	X Peritoneum, forming Douglas's pouch between uterus and rectum.
L Recto-vesical fascia.	

VESSELS

a External iliac.	e A branch of the superior hæmorrhoidal.
b Internal iliac.	f Superior vesical.
c Internal pudic.	g Obliterated hypogastric.
d A pelvic branch of internal pudic distri- buted to connective tissue and rectum.	h Vaginal.

NERVES

1. Great sacro-sciatic.

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