

**On a group of varieties of the muscles of the human neck, shoulder, and chest : with their transitional forms and homologies in the Mammalia / by John Wood ; communicated by Dr. Sharpey.**

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VII. *On a Group of Varieties of the Muscles of the Human Neck, Shoulder, and Chest, with their transitional Forms and Homologies in the Mammalia.* By JOHN WOOD, F.R.C.S., Examiner in Anatomy at the University of London; Professor of Surgery in King's College, London, and Surgeon to King's College Hospital. Communicated by Dr. SHARPEY, Sec. R.S.

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IN the 'Proceedings of the Royal Society,' between the years 1864 and 1868 inclusive, were published five series of observations upon variations in Human Myology, made in the Anatomical Rooms of King's College, London. These observations extended over 202 dissected subjects; they were restricted chiefly to the muscles of the head and neck and those acting upon the extremities, and did not include the numerous irregularities which are usually found in those of the back.

From the extensive range of the subject, and the importance of ascertaining as far as possible the statistical frequency of the abnormal forms, there was little opportunity afforded of giving due prominence to many of the specimens which were entitled to special distinction, either from their first appearance in the records of anatomical science, or from their homological importance as transitional forms, or as representatives of muscles hitherto found only in certain classes of animals.

Many others had, indeed, been recorded by the older or more modern writers under various names, as irregularities of the muscle with which they were connected or contiguous. A great number of these, I believe, were mere varieties of the same transitional specimens, and were placed in this series for the first time in their proper relation and true homological significance to each other.

After some years of practical observation and bibliographical research, I have brought together some of the more interesting groups of these muscular varieties in illustration of the working of the law of variation in modifying muscular formations in the human subject; producing, in some instances, muscles which appear at first to be remarkably aberrant from the ordinary human construction, and identical in some with those which have usually been considered as peculiarly animal formations.

From this point of view one of the most interesting groups of muscles is that of the muscles which connect the *neck* and *shoulder*. From the variability of the bones of the shoulder-girdle and the dissimilar habits and requirements of the different classes of animals, it is not surprising to meet with a perplexing variety in the different portions of their muscular apparatus; but it is striking to find that a great tendency to the same kind of variability is to be found in the shoulder of Man, in which it exists to an extent which

is only surpassed by that of the muscles of the fore arm. The reason for the latter can, from the variety of the uses and functions of the upper extremity, be better comprehended than in the case of the neck and shoulder, which would seem to demand much less various muscular appliances from a teleological point of view, and their varieties therefore might be considered to have a more decided morphological bearing.

I will first take the varieties of one of those groups which has for its function in the human subject to raise the shoulder-girdle behind and before, and to rotate it on the central axis of the shoulder-blade. In animals, the group draws these bones forwards and upwards, or downwards, and they are usually more movable in them than in Man. In both they also act conversely upon the cephalic extremity, either directly or through the neck-vertebræ. In the lower animals we shall find that the muscles of the group frequently obtain a longer leverage by becoming connected lengthwise, or are even blended with other muscles or portions of muscles acting in the same direction, and so obtain a greater play of motion and an increased power of a more direct kind upon the fore limbs and head.

We find in these muscles some of the best examples of what I have called in my former papers, *lateral* and *longitudinal fission*, and *fusion*, of adjacent muscles acting in the same general direction in regard to the axis of the limb.

The normal muscles constituting this group range from as far back, and as deep, as the *splenii* and *serrati*, through the *rhomboids*, the *trapezius*, and the *levator anguli scapulae* to the *sterno-cleido mastoideus* of human anatomy.

The abnormal human muscles include those which I have described briefly in various previous publications in the 'Proceedings of the Royal Society' under the names of the *occipito-scapular*, the *levator claviculae*, and the *cleido-occipital*, reaching as far back as that division of the *splenius* which has been called by WALTHER the *adjutor splenii*, and by MACALISTER the *rhombo-atloid*.

*Occipito-scapular Muscle*.—In the winter of 1866–67 I found in a muscular male subject, on both sides, a muscle extending from the occiput to the base of the scapula, under the trapezius, which I described in the 'Proceedings of the Royal Society' for May 1867, under the name of the *occipito-scapular* muscle. It was a distinct ribbon-shaped muscle, three-quarters of an inch wide, nearly a quarter of an inch thick, and 10 inches long (Plate IX. fig. 1, *d*), attached by a musculo-tendinous origin to the occipital bone on a level with the *splenius capitis* (*h*), and directly under the line of junction between the *trapezius* (T) and a variety of the *sterno-cleido-mastoid*, which was also present, and which I have named the *cleido-occipital* (*c*). Passing downwards and outwards, obliquely across the *splenii*, and between them and the *trapezius*, it became inserted by short tendinous fibres, superficial and opposite to the *rhomboideus minor* (*r*), into the vertebral border of the scapula opposite the base of the spine, its fibres being more or less blended with those of the rhomboids.

Since that time evidences of the muscle have been sought for in fifty subjects. The nearest formation to the complete muscle was again found, last session, in a muscular

male. It existed on both sides. It was a muscular slip 7 inches long, and a quarter of an inch wide, on the right side, but rather shorter on the left. On both sides its lower attachment was identical with that first found, viz. to the base of the scapula opposite the spine (Plate IX. fig. 2, *d, d*). On the right side its upper attachment was to the transverse process of the atlas, along with and superficial to the first digitation of the *splenius colli* (*h'*); on the left side it ended above in the fascia covering the *splenius capitis* (*h*) opposite to the spines of the second and third cervical vertebræ, and was continued onward to the occiput by the intervention of this fascia only. On the right side there coexisted another peculiar muscular slip, having a similar action upon the scapula (*θ*); it lay beneath the rhomboids, arising by a fascial tendon from the spinous process of the seventh cervical vertebra, and passed downwards and outwards in a muscular band, 7 inches long by half an inch wide, crossing obliquely between the fibres of the *serratus posticus superior* (*s*) and the *rhomboideus major* (*R*), and was inserted by a short tendon into the lower angle of the scapula, opposite the origin of the *teres major*. It was absent on the left side. The muscle lay almost entirely parallel to the *occipito-scapular*, with which a simple upward displacement would bring it into exact coaptation, and the action of their fibres was identical, viz. that of rotation of the scapula upon its axis and elevation of its superior angle.

The next gradation was found in a muscular male subject, on the left side only (Plate IX. fig. 3). It was a fusiform slip of muscle ( $\Delta$ ) attached by a thin falciform aponeurosis to the fascia covering the *splenius capitis* (*h*), under cover of a *cleido-occipital* muscle (*c*), which coexisted in this subject also. The fusiform belly was  $3\frac{1}{2}$  inches long, and was placed parallel and superficial to the outer fibres of the *splenius capitis*, ending below in a spreading aponeurosis, which was implanted upon the superficial aspect of the *serratus posticus superior* (*s*), close to its tendon, and under the *rhomboideus major*. The rhomboids were also largely developed and united at their contiguous margins by another cross slip, passing from the spinal origin of the *major* to the scapular insertion of the *minor*. In the same subject and on the same side were found two other slips, given off from the lower margin of the *levator anguli scapulæ* (*f*) from the fourth cervical transverse process. The innermost one ( $\eta$ ), the larger, was somewhat fan-shaped, spreading downwards to be inserted, by its inner fibres, into the fascia covering the *serratus posticus superior* (*s*) about the second or third rib, and by its outer fibres into the fascia covering the hinder surface of the *serratus magnus* (*S*), close to its insertion into the middle of the vertebral border of the scapula. The lesser or outermost slip ( $\epsilon$ ) came off from the border of the muscle like the other, and was inserted wholly into the upper fibres of insertion of the *serratus magnus*.

A somewhat different formation, having the same general character, was seen in another male subject, on the left side only (Plate IX. fig. 4). Two slips of muscle of about the same size as the foregoing ( $\epsilon$  and  $\eta$ ) were here found. The upper one ( $\eta$ ) was attached above, in common with and between the atloid attachments of the *splenius colli* (*h'*) and the *levator anguli scapulæ* (*f*); it lay along the outer border of the

former, and ended below by dividing opposite the last cervical vertebra into two, which were both implanted by separate short tendons into the fascia covering the *serratus posticus superior* (*s*), the innermost near the junction of its tendon and fleshy belly. The other was exactly similar to the smaller one ( $\epsilon$ ) described in the last figure, and was inserted, like it, into the *serratus magnus* close to its insertion into the base of the scapula opposite the spine.

All the abnormal slips of muscle just described were apparently developed in the fascia covering the *hinder* surfaces of the *splenii*, *levator anguli scapulæ*, and *serrati* muscles. The one marked  $\Delta$  in fig. 3 had an origin quite similar to that of the *occipito-scapular* found on the right side in the subject of fig. 2 (*d*); its insertion, however, took place upon the surface of the *serratus posticus superior* instead of upon the *rhomboid* or more superficial muscular layer, which it had, as it were, failed to reach. The other slips ( $\epsilon$  and  $\eta$ ) were directly connected with the scapula through the insertion of the *serratus magnus*, as was also the slip ( $\epsilon$ ) found in the subject of fig. 4.

In the subject of the next illustration (Plate IX. fig. 5), a muscular male, were found muscular slips ( $\epsilon$  and  $\eta$ ) of a precisely similar character, but connected rather with the *front surface* of the *levator anguli* than with the back. The upper and longer one ( $\eta$ ) arose with the third digitation of the *levator anguli scapulæ*, but in front of it, and passed downwards, in *front also* of the fourth slip of origin of that muscle, as a fusiform muscle about 8 inches long, which was inserted by a falciform tendon into the lower part of the base of the scapula, between the insertions of the *rhomboideus major* (*R*) and the *serratus magnus* (*S*). The other slip ( $\epsilon$ ) was similar in its upper attachment to that marked with the same letter in the previous figures, but was inserted below into the *serratus posticus superior* (*s*), instead of into the *serratus magnus*, as was the case with the others.

In two other subjects, both females, were found also slips of muscle connected with and lying upon the *front surface* of the *levator anguli scapulæ*. In one it was found on the right side only, arising from the third cervical transverse process, as a fusiform muscle, which was inserted into the *hinder* surface of the upper digitation of the *serratus magnus* near its scapular attachment. In the other, the subject of fig. 6 (Plate IX.), the muscular slip ( $\eta$ ) arose from the second cervical transverse process, was placed *in front of* the *levator anguli scapulæ*, and was inserted also in *front of* the upper digitation of the *serratus magnus*, upon the fascia covering which its tendon was lost in the axillary space; it was likewise fusiform in shape and about 6 inches in length.

I have now followed these curious transitional slips of muscle in the changes of their upper attachment from the superior curved line of the occipital bone, through the *splenius capitis* and *colli*, to the hinder surface, and, at last, to the front surface of the vertebral origin of the *levator anguli scapulæ*.

At their lower attachments we can trace them also from the base of the scapula, through the insertion of the *rhomboids* and the *serratus posticus superior*, to the back surface, and, at last, to the front surface of the *serratus magnus*. Here we link on a human muscular abnormality, also connected with the front surface of the *levator anguli*

*scapulæ*, viz. the "*levator claviculæ*," which we shall find, when we discuss its homologues in the lower animals, to have something of a correlation with the *occipito-scapular*, placed at the opposite pole from which we started.

Before following this direction, however, I will notice a further indication of transmutation in the direction of the *splenius* muscle, *i. e.* backward, which may be considered to have some relation to the formation of the *occipito-scapular* in the human subject. In HALLER'S 'Disputationum Anatomicarum Selectionum' (1733, vol. vi. p. 589), F. WALTHER gives a description of a muscle connected with the *splenii*, under the name of the "*musculus singularis splenii accessorius*" vel "*adjutor splenii*." This muscle corresponds entirely with a variety I have found in four male subjects out of 41, and in three females out of 29, in a total of 70, in the years 1866, 1867, and 1868 (given in the 'Proceedings of the Royal Society' of these years respectively). One of the females was the subject of fig. 7 (Plate IX.), in whom the variety was found as a flat, ribbon-shaped muscle (*g*), lying upon and parallel with the fibres of the *splenius colli*. Its upper attachment was placed upon the transverse process of the atlas, between the tendons of the *levator anguli* (*f*) and *splenius colli* (*h*). It was hardly to be distinguished at this place, without dissection, from the fibres of insertion of the latter muscle; but, as it descended, it became more distinct and differentiated, and was finally separated from both the *splenii* by the intervention of the tendon of the *serratus posticus superior* (*s*). It was about 6 to 7 inches long, by  $\frac{1}{2}$  an inch wide, passed under the *rhomboideus minor* muscle (*r*), and ended below in spreading tendinous fibres, which became blended, partly with that of the origin of the *rhomboideus major* (*R*), and partly with that of the *serratus*. The muscle has been described also by Mr. A. MACALISTER under the name of the "*rhombo-atloid*" (Notes on Muscular Anomalies in Human Anatomy, in the 'Proceedings of the Royal Irish Academy, April 23rd, 1866).

This formation, I believe, indicates the first loosening or differentiation of the *splenius* muscle in the direction of the formation of an *occipito-scapular* in the human subject. We shall find that, in the Mole, the whole of the *splenius* may become attached to the scapula (see Plate X. fig. 11, *h*).

In the subject of fig. 7 was also found a triple insertion and an extended origin of the *levator anguli scapulæ*. The cervical digitations of the muscle were continued down as low as the sixth transverse process. The three lowest digitations were inserted by two separate slips (*F*), the uppermost (larger) into the base of the scapula opposite the supraspinous fossa; and the lowest (smaller), conjointly with and superficial to the tendon of the *rhomboideus minor* (*r*), into the triangular commencement of the scapular spine. This formation indicates an approach to that found in some of the Carnivora, in whom the muscle corresponding to the human *levator anguli scapulæ* is inserted into the scapular spine close to the *occipito-scapular* (see Plate X. figs. 14 & 15, *f, f*).

I next proceed to describe a highly important human muscular variety, the *levator claviculæ*, to which I have before referred, the formation of which the slips previously described and shown in figs. 5 & 6 evidently foreshadow, and which, it may be said,

constitutes the opposite pole of the line of departure here traced from the *occipito-scapular* muscle.

*Levator clavicolæ Muscle*.—In my paper read before the Royal Society in 1864, I furnished a description and drawings of *levator clavicolæ* muscle which I had found in two male subjects, on both sides.

In Man it usually assumes, as in animals, the form of a flat ribbon-shaped muscle. It is commonly about an inch to an inch and a half wide, arising fleshy by two or more digitations from the first and second, second and third, or third and fourth cervical transverse processes, in common with and in front of the origin of the *levator anguli scapulæ*.

Crossing the posterior triangle (Plate IX. fig. 8, *e*) obliquely downwards, outwards, and forwards, it is inserted tendino-fleshy into the middle or outer third of the clavicle to the median side of, or behind, the fibres of insertion of the *trapezius* (T). We have found this muscle in 4 males out of 131, and in 1 female out of 71, in a total number of 202 subjects. In three it was on both sides, and in two on the left side only. In one other male subject it was found to arise from the third cervical transverse process on the left side only, and, just failing to reach the clavicle, was inserted into the fascia immediately behind it, covering the axillary surface of the upper digitation of the  *serratus magnus* muscle and the plexus of nerves lying upon it. This gives an average of about 3 per cent. in which this muscle has been found; in half on both sides, and in the other half on the left side only.

In looking up the bibliography of this subject, I have found that in 1813 W. G. KELCH described that he had seen, on the right side of a male subject, in whom both the *omohyoids* were wanting, a slip of muscle, a quarter of an inch wide, attached above to the sixth cervical transverse process, and below to the back edge of the clavicle near the acromial end (Beiträge zur pathologischen Anatomie, Berlin, 1813, xxiv. S. 32). This is quoted by F. G. THEILE, who also describes that he saw on the right side of a male a muscle, 1 inch wide, attached above to the fourth and fifth cervical transverse processes, between the *rectus capitis anticus major* and the posterior *scalenus*, and below to the middle of the clavicle at its upper border. It was considered by him as a variety of the *anterior scalenus* muscle (Traité de Myologie, in SÖMMERRING'S Encyclopédie Anatomique, traduit par J. L. JOURDAIN, 1843, p. 153). In 1846 MACWHINNIE described this muscle as a variety of the *levator anguli scapulæ*, arising from the first cervical transverse process, and inserted, in one case, into the outer end of the clavicle with the *trapezius*, and, in a second instance, into the middle of the clavicle close to the *sterno-cleido-mastoid* (London Medical Gazette, January 30th, 1846, p. 194).

In 1847 Professor W. GRUBER, of St. Petersburg, described a muscle attached above to the second cervical transverse process, and below to the middle of the hinder border of the clavicle (in two subjects out of 40), as a variety of the *trapezius* (Vier Abhandlungen, S. 22). This observation is quoted by HENLE in his last edition of the Handbuch (Muskellehre, S. 110) with the remark that it is doubtful whether it is to be con-

sidered as a variety of the *omo-hyoid*, *levator anguli scapulæ*, or *scalenus anticus*; and implying apparently that it may be referred to the *sterno-cleido-mastoideus*.

In 1866 Mr. A. MACALISTER describes it, in a spare female subject, as inserted under the *trapezius* into the outer third of the clavicle (*op. cit.* p. 7).

Besides the foregoing fully formed specimens of the muscle, we have repeatedly found imperfect slips from the cervical attachments of the *levator anguli* and *anterior* or *posterior scalenus*, which were inserted below into the axillary fascia behind the clavicle. Through these slips we travel towards and meet with those which I have before described in connexion with the *levator anguli* and *serratus magnus*, and thus we have a series of transitional forms intermediate between the *levator claviculæ* and the *occipito-scapular* muscles. Specimens of this kind have also been recorded by J. F. MECKEL, viz. a slip passing from the *levator anguli* to the second rib, where it was connected with the *serratus magnus*. He adduces it as an index of the more complete blending of these muscles in the lower animals (Archiv, viii. S. 585, and Muskellehre, 1816, Bd. ii. S. 402). He also quotes J. C. ROSENMÜLLER for a specimen in which a slip of muscle passed from the transverse process of the atlas to the *serratus magnus* (De nonnullis musculorum corp. hum. varietatibus, Leipzig, 1814, S. 5). KELCH saw, in a female, a tripartite division of the *levator anguli scapulæ*, the middle slip sending off from its hinder border an insertion into the *scapulo-thoracic* fascia (*op. cit.* xxv. S. 33).

More recently, Mr. FLOWER and Dr. MURIE found, in a Bushwoman, a slip proceeding from the *levator anguli scapulæ* to the axillary surface of the *serratus magnus*, which they considered to be an indication of the *levator claviculæ* muscle (Journal of Anatomy and Physiology, No. 2, May 1867, p. 199).

The first beginning of a differentiation of the fibres of the *levator anguli scapulæ* we have not unfrequently found as a double muscle. It is thus figured in CUVIER and LAURILLARD'S plates of the muscles of the Negro, the anterior division being described as the homologue of the "*acromio-trachélien*" of the lower animals. MACALISTER has also found this muscle double (*op. cit.*).

*Cleido-occipital Muscle*.—Under this name I described, in a paper published in the 'Proceedings of the Royal Society' in June 1866, an abnormal human muscle placed along the hinder border of the *sterno-* and *cleido-mastoids*, from both of which it is separated by a more or less wide areolar interval, and sometimes joining, above or below, the fibres of the *trapezius*. Its width is from half an inch to an inch and a half, most commonly being about three quarters of an inch. It is made up of parallel muscular fibres, attached above to the superior curved line of the occipital bone by a thin muscular aponeurotic termination between the occipital attachments of the *sterno-mastoid* and *trapezius* muscles. Below it is connected with the back edge of the clavicle about its middle third, extending, when large, nearly or quite to the insertion of the *trapezius*, diminishing much the size of, and crossing or covering in the posterior triangular space (Plate IX. fig. 9, c). It is distinguished from the *cleido-mastoid* by its superficial position, by the more oblique and more backward direction of its fibres, and by its attachment to



the superior curved line of the occipital bone, as well as by a more or less marked areolar interval between the two. The fibres of the latter muscle are directed from the clavicle upwards and forwards in such a manner as to become, in the upper part of the neck, entirely covered by those of the *sterno-mastoid*, which form here the entire posterior border of the compound human *sterno-cleido-mastoid* muscle, to the exclusion of those of the *cleido-mastoid*, which pass more deeply and are directed more forwards to the mastoid process.

We have found the *cleido-occipital* muscle more or less developed in 37 subjects out of 102, viz. in 27 out of 68 males, and in 10 out of 34 females. In 34 it was found on both sides, and in 3 on one side only. In two instances in which it was found on one side only, there existed on the opposite side a *levator claviculæ* muscle, showing a sort of correlation between the two formations. In two instances the muscle was double, or divided into two distinct portions. In two more male subjects the formation was so peculiar as to merit a more detailed description; one of them was the subject of fig. 29, Plate XI. Besides the ordinary clavicular attachment (*c*), which was connected with the bone near to that of the *trapezius* (T), so as almost entirely to cover the posterior triangle, there arose from the sternal end of the clavicle, external to and partially separate from the sternal origin of the *sterno-mastoid*, a strong flattish tendon giving origin to a considerable bundle of parallel muscular fibres (*c'*). These crossing upward and backward, superficial to the origin of the *cleido-mastoid* proper (*b*), joined, about the middle of the neck, the fibres from the ordinary origin (*c*), and were inserted with and anterior to them into the superior curved line of the occipital bone. The appearance of a completely double *sterno-cleido-mastoid* was thus given to the subject, bearing a striking resemblance to the formation of the homologous muscles in the striped Hyæna, Polecat, Genette, Coati, and Marmot, as figured in CUVIER and LAURILLARD'S plates of these animals.

The muscular variety which I have distinguished by the name of *cleido-occipital* has been observed and described by various writers as an occasional variety of the *sterno-cleido-mastoid* or *trapezius* muscles.

It is mentioned by SÖMMERRING (De Corp. Hum. Fabric. p. 112), and was found by KELCH coexistent with a double *sterno-cleido-mastoid*, the whole possibly having been a formation similar to that last described (Beiträge, xxi. p. 31).

MECKEL describes it, both in the human subject and in animals. In the latter he states that it sometimes joins, below, the anterior fibres of the deltoid (*cephalo-humeral*); and in his description of *Ateles* and Magot, and some other animals, he seems to have looked upon it as a variety of the *acromio-trachélien* (*levator claviculæ*), and through this arrangement he appears, moreover, to have connected the latter with the *trapezius* rather than with the *levator anguli scapulæ*, as indicated by CUVIER (MECKEL, De Duplicitate Monstrosa, pp. 40, 41, and Muskellehre, p. 475).

THEILE describes an oblique slip of muscle, three lines wide and one thick, attached to the superior curved line of the occipital bone, partly under the *trapezius*, and spreading

out below so as to cover the clavicular fibres of the *sterno-cleido-mastoid* and to join, finally, its sternal origin. This also may have been the double-headed variety of the *cleido-occipital* just described (Encyclop. Anatom. pp. 163, 164, 165).

MACWHINNIE mentions the clavicular origin of the *sterno-cleido-mastoid* as occasionally forming two distinct muscles, and sometimes blending with the fibres of the *trapezius* (*op. cit.* p. 186).

HALLETT found, in three subjects, a muscle arising from the clavicle, separate from the *sterno-cleido-mastoid* and the *trapezius* respectively. He also found a muscular slip joining the *trapezius* at the occiput, and the *sterno-cleido-mastoid* at the clavicle, and also more frequently (1 in 16 cases) meeting the clavicular insertion of the *trapezius* (Edinburgh Medical and Surgical Journal, 1846, p. 6). R. WAGNER discovered a similar slip, joining the *trapezius* at the clavicular insertion, on both sides of a female subject (HEUSINGER'S Zeitschrift, Bd. iii. S. 337). GRUBER found a slip of muscle arising from the clavicle, completely separate from the *sterno-cleido-mastoid* and *trapezius*, in 2 subjects out of 40, and with a separation less complete in 1 out of every 3 subjects. In 7 out of 70 subjects this observer found the same muscle joined above more or less with the *trapezius* (Vier Abhandlungen, S. 16, 17, 18). HENLE mentions it as an occasional abnormality of the *sterno-cleido-mastoid* (Muskellehre, S. 110), and QUAIN as a variety of the *trapezius* (Arteries, pl. 25). FLOWER and MURIE found a good specimen of the formation on both sides in the Bushwoman. It was best marked on the left side, and consisted of a long narrowish band of fibres attached above to the occiput half an inch from the *trapezius*. It crossed the posterior triangle, and was inserted into the clavicle an inch from its outer end (Journal of Anatomy and Physiology, May 1867, pp. 197, 198).

In connexion with this muscle we must place also, I believe, the occasional remarkable formation of the clavicular fibres of the *trapezius* described as an occasional human variety by QUAIN, MACWHINNIE, HALLETT, and GRUBER (*op. cit.*), and in my own paper in the Royal Society's 'Proceedings' for 1867 (No. 93, p. 522). In these cases, which have a considerable resemblance to each other, the anterior border and clavicular insertion of the *trapezius* appears to be prolonged over the posterior triangle, so as more or less completely to cover it, and to become connected with the origin of the *cleido-mastoid*. Opposite the middle of the clavicle a tendinous arch, thrown over the middle and sternal divisions of the descending cervical nerves and over the external jugular vein, affords attachment to the median portion of the muscular fibres in place of the clavicle itself. In the instances I have myself met with, an areolar interval more or less marked has usually existed between this irregular extension of the insertion and the normal fibres of the *trapezius*. The superficial insertion into the aponeurotic arch, formed in the deep fascia of the part, is connected below to the fascia of the arm, and indicates an homology with the brachial prolongation of the *levator humeri* of the lower animals. The intimate connexion of this abnormal part with the *trapezius* indicates its relation to those formations in which the so-called "*trapezius clavicularis*" of the Carnivora and Rodents is entirely absorbed in the formation of the great "*cephalo-humeral*" muscle.

In connexion with this abnormality I would also place, as a lateral displacement, the variety recorded by R. WAGNER as an irregularity of the *trapezius*, viz. an accessory muscle passing from near the mastoid process to the acromion process under the last-named muscle (*op. cit.* S. 337).

COMPARATIVE ANATOMY.—If we now turn to the homologies of the foregoing muscular varieties in the Mammalia, we shall find a correlation between these several developments sufficiently striking and suggestive.

It was asserted by MECKEL, against the opinion of CUVIER (*Anat. Comp.* vol. vi. p. 236), that in the lower mammalia the cervical portion of the *serratus magnus* was the most usual homological representative of the lower divisions of the *levator anguli scapulæ* of Man and the higher Quadrumana; extending usually as high only as the transverse process of the third cervical vertebra, it becomes, in most of these animals, continuous with the upper border of the thoracic *serratus*, at the last cervical transverse process. In the Badger and Weasel among the Carnivora, the Rabbit and Surmulot among the Rodents, and in the Bonnet-Monkey of the lower Quadrumana, I have found an areolar separation of the cervical from the thoracic part more decided than that between the other digitations, a division which becomes in the higher Quadrumana still more evident.

*Occipito-scapular Muscle.*—In 1775 Dr. JAMES DOUGLASS described in the Dog, under the name of the “*levator scapulæ minor vel posterior*,” a muscle separate from but in the same layer as the rhomboids, arising from the occiput near its crest, superficial to the *splenius*, and inserted in connexion with and above the *rhomboideus minor* into the upper angle of the vertebral border of the scapula. Under the name of the “*levator scapulæ major vel anterior*,” he also described, in the same animal, a ribbon-shaped muscle, arising from the first cervical transverse process, and inserted into the scapular spine near its outer end. In these two muscles we have evidently the homologues of the opposite extremes of the human varieties before described, and represented by the fully formed *occipito-scapular* and *levator claviculæ*. The homologue of the former was described by J. F. MECKEL, under the name of the *rhomboïde antérieur*, as a separate muscle, reaching from the angle of the scapula to the occiput, in the Magot and Lemurs, and forming one sheet with the *rhomboids* in the Coati. In the Insectivora he describes it in the Mole and Hedgehog as a separate muscle, and in the Armadillo as joined with the rhomboids. In the Carnivora he describes it in the Marten, Potto, Bear, Hyæna, Badger, Dog, and Cat, usually united to the other rhomboids and reaching as far as the occiput. In the Rodents he describes it in the Beaver, Porcupine, and Marmot, partially separated from the other *rhomboids* in the first, but united to them in the two latter; and he also describes it in the latter condition in the *Didelphis marsupialis* (*Anat. Comp.* vol. v.). In CUVIER, LAURILLARD, and MERCIER’S magnificent ‘*Receuil de Planches de Myologie*’ (*Anat. Comparée*, Paris, 1855), this muscle is figured under the name of the “*rhomboïde de la tête*” as large and separate from the other *rhomboids* in *Callithrix*, Magot, *Papio Mormon*, Coati, Sajou, and Marmoset. In the Lion it is represented as continuous with the other rhomboids; but it constitutes a separate muscle in the Panther,

Black Bear, Coati, Badger, Genette, Polecat, Dog, and Otter. It is also figured in the Hedgehog, Mole, and Armadillo. In the *Orycteropus* it is noted as the *rhomboïde du cou*. It figures also in the Hippopotamus, Peccary, and Pig; in the Hare, Beaver (large), Paca, Agouti, Capybara, Porcupine, Rabbit, and Squirrel; and in the great Kangaroo, Kangaroo-Rats, and Phalangers. Both CUVIER and MECKEL also figure it in the *Ornithorhynchus*. In the *Orycteropus capensis* the *rhomboideus minor* is described as reaching to the occipital crest by HUMPHRY (Journ. of Anat. and Phys. May 1868, p. 299) and by J. C. GALTON (Trans. Linn. Soc. vol. xxvi. p. 590). The former author also describes the same arrangement in the Seal; and the latter states that, in the Six-banded Armadillo, the *occipito-scapular* muscle is enormously developed, arising from the whole of the occipital crest, and inserted into the *supraspinous* fascia, as well as into the upper angle of the scapula (*op. cit.* p. 525).

It is described by KRAUSE in the Rabbit under the name of the *levator anguli scapulæ vel scapulæ minor* (Anat. des Kaninchens, Leipzig, 1865, S. 104), and also by MIVART and MURIE in the same animal. The latter authors also describe it in the *Hyrax capensis* as blended with the *rhomboids*, and in the Hare and Guinea-pig under the name of the *occipito-scapular* or *rhomboideus capitis* (Proceedings of the Zoological Society, April 1865, p. 335, and June 1866, p. 393).

In the *Echidna hystrix* MIVART describes the *rhomboideus cervicalis* as reaching up to the occiput (Trans. Linn. Soc. vol. xxv. 1866). I have myself found this muscle in the Bonnet-Monkey, separate from the other *rhomboids* (Plate X. fig. 12, *d d*), and also in the Hedgehog (Plate XI. fig. 22, *d*), Mole (Plate X. fig. 11, *d*). In the last it constitutes a very distinct ribbon-shaped muscle (*d*), lying upon and parallel to the *splenius* (*h*), in no way connected with the other *rhomboids*, which are very feeble and almost wanting, nor with the *trapezius* (T), which overlies it. I have also found it in the Dog, Cat (Plate XI. fig. 23, *d*), Badger (Plate X. fig. 14, *d*), Weasel (fig. 15, *d*), Rabbit (fig. 16, *d*), Squirrel (fig. 18, *d*), and Norway Rat (fig. 19, *d*), in which last animal it is of a great size. This muscle has thus a very extensive range of existence in the Mammalia, and is represented by many specimens in most of the families. A very striking instance of modification in the attachment and uses of a muscle, having a suggestive resemblance to the differentiation of the *splenius* in the human variety before described (*rhombo-atloid*), is found in the lower attachment of this muscle in the Mole (see fig. 11, *h*). In this animal the *splenius* is a large, thick, and powerful muscle, lying immediately under the *occipito-scapular*, attached extensively in front to the occiput, and tapering off behind, where it is attached, not to the spinous processes of the vertebræ, but to the end of the *scapula*, which are united to each other across the spine by an interscapular ligament, upon the superficial surface of which are developed a few transverse fibres, feebly representing the *rhomboids*. The whole apparatus is freely moveable backwards and forwards upon the spine. According to MECKEL, there is developed in the cervical and dorsal supraspinous ligaments in this situation an ossicle or cartilage, but this I was unable to find in the specimen which I examined and from which the drawing was taken.

The *splenius* is hereby transformed from a spinal muscle into one acting upon the combined fore legs and head, moving freely over the spine, and it becomes a notable accessory force in aid of the action of digging and burrowing with the snout and fore paws.

The muscle just described seems to correspond to that described by MECKEL as a very strong *rhomboid*, attached to the moveable ossicle. The muscle upon which it rests, however, seems to me to be clearly the *complexus*, with the large *trachelo-mastoid* muscle to its outer side, constituting the only muscular layer which intervenes between the muscle in question and the *semispinalis* and *multifidus* system of fibres, with the *obliqui* and *recti* of the occiput. The direction of the fibres of this muscular layer corresponds with that of the *complexus*, viz. from the transverse processes forwards and a little inwards to the median line of the occiput, where the two fellow muscles are closely placed together at their insertion.

*Levator claviculæ Muscle*.—Synonyms: The "*levator scapulæ major vel anterior*" of DOUGLASS and BURMEISTER; the "*omo-*" or "*acromio-trachélien*" of CUVIER and MECKEL; the *acromio-basilar* of VICQ D'AZYR; the *clavio-trachélien* of CHURCH; the *basio-humeralis* of KRAUSE; the *Kopf-Arm-Muskel* of PEYER; the *transverso-scapulaire* of STRAUSS-DÜRCKHEIM; the *omo-atlanticus* of HAUGHTON; and the *cervico-humeral* of HUMPHRY.

The homologies of this muscle in the Mammalia form too extensive a subject, and one presenting too many complex modifications, to be fully entered into in this paper. I will content myself with indicating the principal changes which occur in it, selecting such specimens as may throw light upon the developments I have found in the human subject.

In by far the greater majority of animals the muscle arises from the transverse process of the atlas singly. In some it extends also to that of the axis; and it seems to represent that which in Man and the higher *Simiadae* are the two upper digitations of the *levator anguli scapulæ*. In the Rodents and Pachyderms, however, we shall find that, by becoming amalgamated by longitudinal and lateral fusion with the *recti capitis*, it may be attached to the lateral or basilar processes of the occipital bone.

In the Gorilla, Chimpanzee, and Orang it is always present, arising from one or two of the upper cervical transverse processes, and inserted into the clavicle external to its centre. This insertion into the clavicle, which is found, as we have seen, in the human subject, and has given to it the name of *levator claviculæ*, becomes in the lower Quadrumana, by external transposition, shifted to the upper border of the acromion process of the scapula (*omo-* or *acromio-trachélien*). Its clavicular attachment, however, reappears, according to MIVART and MURIE, in the *Nycticebus tardigradus* or Slow Loris (Proc. Zool. Soc. 1865, p. 243), and is found universally in the Bats, attached to the outer end of the clavicle close up to the insertion of the *trapezius*. In the former animal, as described by the above authors, the muscle arises singly from the transverse process of the atlas, the *levator anguli scapulæ* arising as far forwards as that of the axis, as well as from all the cervical transverse process behind that point. The single origin prevails also in most of the lower Quadrumana. In the *Papio Mormon* and Magot it arises from the axis as well as the atlas (CUVIER and LAURILLARD, plates 29 & 30). In these Apes, and in *Ateles* and *Callithrix* also, its scapular insertion is covered by the front fibres of

the *trapezius*. I have found the same arrangement in the Bonnet-Monkey (Plate X. fig. 12, *e*). It is also the case, according to MIVART, in *Cercopithecus sabæus* (Proc. Zool. Soc. Jan. 10, 1865).

In *Ateles* and Magot MECKEL describes this muscle as double, having apparently connected it with the development of a *cleido-occipital* muscle, which is also found in these animals. This part of the supposed double muscle MECKEL refers to the *trapezius*, with which he thus connects the muscle under consideration rather than with the *levator anguli scapulae*, as CUVIER does.

In the Coati, Marmoset, Slender Loris, and *Lemur macaco*, according to CUVIER, the *acromio-trachélien* passes superficially over and across the front fibres of insertion of the *trapezius* to be inserted into the superficial aspect of the acromion process, constituting apparently a form transitional to that of its insertion in the Carnivora and Rodents, where we usually find a *metacromial* process developed downwards from the outer end of the spine of the scapula (see Plate X. figs. 15 & 16, *z*). By this means is provided a longer leverage for the muscle, enabling it to rotate powerfully the shoulder and anterior extremity outwards from the trunk, around the long axis of the scapula. In the Hedgehog (fig. 18, *e*) the muscle is inserted superficial to the *trapezius* into the acromial process. It is totally absent in the Mole. In the Six-banded Armadillo (*Dasypus sexcinctus*) Mr. GALTON describes an *acromio-basilar* muscle taking origin from the lateral ridge of the supraoccipital bone and inserted into the metacromion process of the scapula (Trans. Linn. Soc. vol. xxvi. p. 527). This slip of muscle is, however, considered by CUVIER (plate 259. fig. 2) and by MECKEL (*op. cit.* p. 480) as the cervical portion of the *trapezius*, with which its origin from the supraoccipital bone would certainly ally it, while its insertion into a metacromial process would not be incompatible therewith. In the *Orycteropus capensis*, Professor HUMPHRY describes this muscle, under the name of the *cervico-humeral*, as arising from the transverse process of the atlas, and inserted superficial to the *trapezius* into the spine of the scapula. In the Tamandua it reaches over and far below the scapular spine and *trapezius*. It is not figured in CUVIER and LAURILLARD'S plates of the Sloth, Anteater, or Armadillo. In those of the Lion and Panther it is represented as large, wide, and covered at its insertion by the *trapezius*; but in the Bear, Striped Hyæna, Coati, Badger, Polecat, Genette, Dog, and Cat it passes superficial to the insertion of the *trapezius* to the metacromion process. In the Cat I have found it to become at its origin partially blended with the *rectus capitis anticus major*, and thus to arise, as we find it also in the Rabbit, partly from the basilar process of the cranium (see Plate XI. fig. 23, *ee*, and Plate X. fig. 13, *e*). In the Otter, HAUGHTON describes the muscle as subdivided into two parts, one attached to the outer or lower, and the other to the inner or upper end of the scapular spine (Proc. Royal Irish Acad. vol. x. pt. iv.). In the Seal it is also, according to HUMPHRY, divided into two parts, one passing to the outer tuberosity of the humerus with the *trapezius* (thus extending still further its range of action as a swimming-muscle), while the other overlaps the *supraspinatus*, and is inserted into the angle of the scapula (*op. cit.* p. 299).

This remarkable bifurcation of the muscle I have myself found both in the Badger and the Weasel (Plate X. figs. 14 & 15, *e, f'*); it bears significantly upon the connexion I have endeavoured to establish in this paper between the anterior and posterior levators of the scapula. In the latter of these animals the muscle arises by a single origin from the transverse process of the atlas; in the former it extends as far as that of the axis, as is sometimes the case in the Dog. Almost directly two flat, ribbon-like, diverging muscles are formed, one passing backwards and downwards to be inserted, superficial to the *trapezius*, into the metacromial process, and the other backwards and upwards, to join at insertion to that of the *occipito-scapular* at the angle of the scapula. Both the muscles are inserted also into the supraspinous fascia, and into the vertebral end of the scapular spine itself, under cover of the *trapezius*. The last-described division of this double muscle is evidently the homologue of the first or atloid digitation of the human *levator anguli*; it has the same origin, course, and insertion, and forms in the same manner a link of connexion between the origin of the anterior *levator scapulae* or *acromio-trachélien* and the insertion of the posterior or *occipito-scapular* muscle. This link is rendered more continuous by the abnormal human varieties which I have described in the earlier part of this paper.

A perplexing resemblance to the bifurcation above described is seen in the arrangement of this muscle in the Rabbit (Plate X. fig. 16, *e b*); this will, however, be found, on closer inspection, to be essentially different in its nature. In this animal, as well as in the Guinea-pig, the origin of the muscle becomes blended (as we have seen to be the case in the Cat) with the fibres of the *rectus capitis anticus major*, contributing to form a thick muscular mass between the pharynx and the vertebræ (see fig. 13, *u, v, b, and e*). The outer part of the apparently double muscle is attached also to the transverse process of the atlas (1), while some appear to be connected with the *rectus minor* (*v*); but the greater and inner portion arises directly from the basilar process of the cranium, close and external to the insertion of the *rectus major* (*u*), and near the line of suture between it and the mastoid process and the large tympanic protuberance. The two parts composing the muscular mass are easily separated along a loose areolar interval extending quite up to the base of the skull; they pass together along the neck, crossed by the *sterno-mastoid* (fig. 16, *a*) and *cleido-occipital* (*c*) muscles, and then separate in the posterior triangle,—the upper or hinder one (*e*) to be inserted, superficial to the *trapezius*, into the prolonged metacromial process (*z*), and the other to join the tendinous intersection connected with front of the rudimentary clavicle (*x*) at its outer half, where it assists in forming the great *cephalo-humeral* muscle. The first of the two muscles is described by KRAUSE (*op. cit.* S. 103) as the "*levator scapulae major*," and the latter as the "*basio-humeralis*," referring this erroneously as a homologue to the "*transverso-scapulaire*" of STRAUSS-DÜRCKHEIM,—an homologue which applies more correctly to the former muscle.

This curious shifting of the origins and insertion of these muscles has given rise to the perplexing multiplication of names which meets us in the literature of this subject. It

has also, as I shall endeavour to prove, led to the concealment of the real homologies of the last-described muscle in the Rabbit, as well as of those of the muscle marked *c* in the figure, which has been confounded with it. The muscle which is called by KRAUSE the *basio-humeralis*, presents, I believe, strong grounds for referring its homology to the *cleido-mastoid* of human anatomy. First, its lower attachment to the clavicle and its participation in the formation of the *levator humeri* is upon this supposition at once explained. Its deep position in relation to the muscles marked *a* and *c*, viz. the *sternomastoid* and *cleido-occipital*, is also more in accordance with this supposition. Its origin from the basilar process takes place close to the suture between it and the mastoid bone, some of its fibres even arising from the latter. Its deep displacement may in fact be referred to the great development of the tympanic element necessary to support the enormous ears of the animal, at the expense of the occipital and mastoid development, which are small and compressed. A comparison of the relative position of the three muscles marked *a*, *b*, and *c* in the figures of the Rabbit, with those of the Hedgehog (Plate XI. fig. 22), and especially with those of its congeners, the Squirrel (Plate X. fig. 18), and the Norway Rat (fig. 19 and fig. 26, Plate XI.), will render the resemblance of the muscles herein treated as homologous, more plain than any description, and will tend to remove the confusion into which, by want of precision, the names of these muscles have been plunged. The relation of the muscle to the true *levator claviculæ* (*e*) is thus one of juxtaposition merely, and not one of derivation. A further test of the accuracy of viewing this muscle as a *cleido-mastoid* is to be found in the arrangement of the group in the Ruminants as compared with the *Solidungulata*.

In the fawn of a Fallow Deer dissected by my friend and former pupil Mr. NETTLESHIP, from whose sketch figure 20 (Plate XI.) was taken, it will be seen that the *levator humeri* (*b e*) (*cephalo-humeral*) is made up of two parts (*b* and *e*) exactly corresponding to those of the Rabbit just described. They are marked with corresponding figures. The posterior or superior portion, or that corresponding to the *acromio-trachélien* or *levator claviculæ* (*e*), is the larger, and arises from the transverse process of the atlas. The anterior or inferior portion (*b*) joins the fibres of the *rectus capitis anticus major* (*u*), and is attached with it to the basilar process of the cranium. The two join about the middle of the neck to form one compound muscle (*b, e*), which passing over the shoulder without any clavicular "inscription," is inserted with the fibres of the *pectoralis transversus* (*major*) into the humerus just above the outer condyle. As the portion *e* corresponds clearly to the muscle which in the Rodents and Carnivora is attached to the metacromial process (and which MIVART and MURIE found in the Hare and Rabbit to send some fibres down to the humerus), so the portion *b* is clearly the homologue of that which I have considered in the Rabbit as the *cleido-mastoid*, blending in the same way with the *rectus capitis anticus major*. To enhance the value of this proof, the *sternomastoid* (maxillary) (*a*) in the fawn sends off a slip (*a''*) to join, and thus to claim connexion with, its usual colleague, the *cleido-mastoid*, in its new connexions with the *rectus capitis anticus major*.



A further light is thrown upon this arrangement by that found in the Donkey, of which the succeeding figure (Plate XI. fig. 21) was drawn from a sketch made also from nature by Mr. NETTLESHIP. In this animal the *acromio-trachélien* (*levator claviculæ*) (*e e*) arises by four digitations from the four upper cervical transverse processes, and is a far larger muscle than the *cleido-mastoid*, much resembling in appearance the origin of the human *levator anguli scapulæ*. The *cleido-mastoid* portion (*b*), however, arises, not in common with the *rectus capitis anticus* (*u*) from the basilar process, but with the *rectus lateralis* (*w*) from the paramastoid process just behind the ear, as in most of the Mammalia, and clearly asserting its homology with the human *cleido-mastoid*. The two muscles have exactly the same relation to each other as those of the Fallow Deer, and form, in the same manner, the compound *levator humeri* muscle (*b c*). As an evidence of the like tendency to transposition evinced by this group of muscles in the large heavy animals, both long- and short-necked, I may allude to the fact that in the Ass and Horse, as well as in the Camel, Elephant, Hyrax, and most of the Ruminants, the *sterno-mastoid* is inserted into the angle of the mandible (hence called *sterno-maxillaris* vel *mandibularis* by veterinary anatomists). In the Peccary, Hippopotamus, Pig, and Tapir it is, however, inserted into the mastoid process, with a slip to the transverse process of the atlas in the Hippopotamus.

The question now arises,—What, then, is the homologue of the muscle which has been usually considered by writers on the subject as the *cleido-mastoid*, viz. that marked *c* in the figure of the Rabbit (Plate X. fig. 16)? Its superficial position in relation to, and parallelism with the fibres of, the *sterno-mastoid* (*a*), its attachment to the ridge of the occipital bone as far as that of the *trapezius*, its intermediate position here between these two muscles, together with its superficial position at its attachment to the clavicle (*x*) in relation to the other muscle which I have affiliated to the *cleido-mastoid* (*b*), which it assists in forming the compound *levator humeri* muscle (*b c*), all lead me to consider it as the representative of the *cleido-occipital* muscle which I have described as a human variety. A comparison with the same muscle in the Guinea-pig (Plate X. fig. 17, *c*), and still more in the Squirrel (fig. 18, *c*) and Norway Rat (Plate XI. fig. 26, *c*), will render this more clear. In the Guinea-pig the muscle (*c*) has its cranial attachment to the ridge of the occipital bone, and not to the mastoid, reaching from the insertion of the *sterno-mastoid* to that of the *trapezius*. No other muscular fibres, except a few which join it high up from the last-named muscle, and which may represent the true *cleido-mastoid*, assist it to form the *levator humeri* (*c'*) in the arm. It is apparently the only muscle from the upper part of the neck or head which is connected with the clavicle (*x*).

In the crested Agouti (*Dasyprocta cristata*), MIVART and MURIE found a very similar blending of the two corresponding muscles on the right side (*op. cit.* p. 391). These authors recognized in this animal the homology of the *levator claviculæ* muscle, which they describe as arising by a tendon from the *basis crani*,—one part (the inner) being inserted into the outer end of the clavicle (the *cleido-mastoid* of this paper), and the

other passing over the shoulder adherent to the *trapezius*, to help to form the *levator humeri* muscle at its insertion into the proximal end of the radius. They point out that this part probably led MECKEL to the false homology of considering this muscle to be represented by the anterior part of the *trapezius*. In the Hare they found that the outer part was inserted into the metacromial process. In the Porcupine, Capybara, and Paca the *acromio-basilar* is very large, and in them, as well as in the Agouti, Guinea-pig, Squirrel, Norway Rat, and Rat-mole of the Cape, it is placed superficial to the *trapezius* at its insertion into the acromion process. In the Guinea-pig I have found it to join the *rectus capitis anticus major*, and to be attached with it to the base of the cranium; in the Squirrel and Norway Rat, however, it arose, in the specimens I have dissected, from the transverse process of the atlas only. MECKEL did not seem to recognize it as a separate muscle in the Agouti, Paca, Squirrel, Hamster, or Guinea-pig, appearing to consider it as part of the *trapezius*. In the *Hyrax capensis*, according to MURIE and MIVART, it is strong, arising from the transverse process of the atlas, passing over the neck of the scapula, and inserted into the fascia covering the *teres minor* (Proc. Zool. Soc. April 1865, p. 334). In the Elephant, according to CUVIER and LAURILLARD's plates, it is large and superficial to the *trapezius* at its insertion; this is also the case with the Horse and Ass. In the Hippopotamus, Peccary, Pig, and Tapir it is small, and placed at its insertion superficial to, or on a level with, the *trapezius*.

In the Kangaroo HAUGHTON describes it as very broad, arising from the three upper cervical transverse processes, and inserted into the whole length of the clavicle as well as into the outer third of the scapular spine (*op. cit.* vol. ix. part 4). CUVIER also describes it as large in the Great Kangaroo, Sarigue, and Phalangers, and inserted under cover of the *trapezius*, a well-marked and distinct *levator anguli scapulae* being also figured as coexistent in the 'Recueil de Planches.'

The *levator claviculae* was found by MIVART in the *Iguana tuberculata*, arising from the transverse process of the atlas, and inserted into the acromial end of the clavicle and front margin of the scapula (Proc. Zool. Soc. June 1867, p. 780).

*Cleido-occipital Muscle*.—Second *cleido-mastoid* of MECKEL; *portio cervicalis trapezii* of CUVIER; *trapezius clavicularis* of HAUGHTON; *clavo-cucullaire* of STRAUSS-DÜRCKHEIM.

In the Mammalia this muscle approaches most closely to its occasional formation in the human subject among the higher *Simiadae*. It is distinguished from the *sterno-* and *cleido-mastoids* on the one hand, and the *trapezius* on the other, in the Chimpanzee and Orang, where we find a simple areolar interval between it and these muscles. It is marked in the 'Recueil des Planches' of CUVIER and LAURILLARD, both in the text and illustrations of Callithrix, Sajou, and Marmoset. I have found it but slightly separated in the *Macacus radiatus* (Plate X. fig. 12, c). It is very broad in the Slender Loris and *Maki vari*. It is well marked and quite distinct in the Hedgehog (Plate XI. fig. 22, c), being attached below to the clavicle, outside of and deeper than the *cleido-mastoid* (b); and above to the curved ridge of the occipital bone, in connexion with the insertion of the *trapezius* (T). It is seen in the figure of the Tenrec given by CUVIER

and LAURILLARD. In the Mole (Plate X. fig. 11, *c*) a broad and large muscle, parallel with the *sterno-mastoid* (*a*), seems to embody in itself both the *cleido-occipital* and *cleido-mastoid*; in this animal the origins of the *sterno-mastoids* cross each other over the median line. In the Bats, which have no *cleido-mastoids*, the *cleido-occipital* muscle seems to be represented by the occipital or neck portion of the long extensor of the wings, called by CUVIER the "*dorso-occipital*," which passes superficially over the clavicle to the thoracic limb, and is, apparently, the homologue of the *cephalo-humeral*. In the Armadillo Mr. GALTON describes, under the name of the *levator claviculæ*, a muscle arising from the occipital aponeurosis outside the *trapezius*; it is placed along the edge of, and parallel to, the *cleido-mastoid*, and is inserted close to its outer side into the clavicle. It is figured also by CUVIER and LAURILLARD in the same animal. It is clearly the homologue of the *cleido-occipital*, and not of the *levator claviculæ*. In the Great Anteater the muscle is very large and distinct, excluding the *trapezius* altogether from the occiput: it was considered by MECKEL as a second *cleido-mastoid* in this animal.

Through the clavicate and semiclavicate Rodents the homologies of the *cleido-occipital* muscle can be clearly traced to the upper or cephalic element of the compound *cephalo-humeral* muscle which forms so important a part in the shoulder of the Carnivora. In the common Squirrel (Plate X. fig. 18, *c*) the muscle is connected at the occiput with the cranial attachment of the *trapezius* (T), which overlaps it superficially; below it is attached to the clavicle superficial to the *cleido-mastoid* (*b*). Intervening between it and the scapular attachment of the *trapezius* emerges the *acromio-trachélien* (*e*), to be attached to the acromial process superficial to the last-named muscle. This intervention of the *acromio-trachélien*, which I have before especially noted in this paper, is important as enabling us to discriminate between that portion of muscle which I take to form the homologue of the *cleido-occipital*, but which in the Carnivora and some Rodents is described by preceding writers as the clavicular portion of the *trapezius* itself. In the Flying Squirrel, the Beaver, and the Surmulot, this part forms equally a separate and distinct muscle, attached to the occiput near the *trapezius*, and separately to the clavicle below (see Plate XI. fig. 26, *c*). In the latter, as seen in the figure (*c*), the lower end is shifted outwards towards the acromial end of the clavicle, and with it is shifted the origin of the *cleido-mastoid* (*b*), so as still to preserve its relative superficial position; it is as if the clavicle had been elongated mainly at the inner or sternal end. In these animals the muscle has been described by anatomists as a second *cleido-mastoid*, but its invariable occipital attachment, the direction of its fibres, and its wide separation at its upper attachment from the real *cleido-mastoid* sufficiently distinguish it from that muscle. In the Marmot it is very large, and excludes the *trapezius* both from the occiput and the clavicle; anteriorly it passes forward superficial to the *cleido-mastoid*, and joins the hinder edge of the *sterno-mastoid*. In the Capybara and some other Rodents also, and in the Carnivora generally, it excludes the *trapezius* from the occiput, and is inserted into the movable clavicle, or the aponeurotic "inscription" which represents it, to which it is attached superficial to the *cleido-mastoid*, forming with it the cervical or cephalic

portion of the *cephalo-humeral* muscle, the lower part of which is formed by the muscles which form, in Man, the clavicular fibres of the *deltoid* and *pectoralis major*. In some, as in the Cat, this compound muscle is inserted as far down as the coronoid process of the ulna by longitudinal fusion with the *brachialis anticus*; but in most, as in the Dog, Badger and Weasel, and in the Rabbit and Guinea-pig, it is inserted into the humerus close below the *pectoralis major*. It will be seen, then, that I find the homologue of the *cleido-occipital* in the muscle which MECKEL and CUVIER described as a second *cleido-mastoid* in the Insectivora and semiclavicate Rodents, as well as in that which they have described in the Carnivora as the *cervical portion* of the *trapezius*, or the *trapezius clavicularis* (the *clavo-cucullaris* of STRAUSS-DÜRCKHEIM). The intervention of the acromial insertion of the *acromio-trachélien* between the fibres of this muscle and the *trapezius* proper, before alluded to, and the gradual way in which it excludes the *trapezius* from the occipital bone in the lower Apes and Monkeys, its relation to the latter muscle at the occiput, and the occasional blending at their adjacent borders as an abnormal human variety, are all circumstances which favour this view, which has also the merit of simplifying the perplexing homologies of the cephalic portion of the compound *cephalo-humeral* muscle, and explaining, more fully than before, the abnormal human varieties so frequently found in connexion with the side of the neck and shoulder. The identity of these homologues is well seen in the transitional forms found in the Insectivora and in the clavicate and semiclavicate Rodents, as I have shown in the case of the Rabbit and Hedgehog.

In many of the Carnivora the cephalic and cervical portion of the compound *cephalo-humeral* muscle is enormously developed, encroaching upon and excluding the *trapezius*, not only from the occiput, but also from the neck-vertebræ (see Plate XI. fig. 23, *c*). Forming a broad sheet of muscle, with the fibres directed downwards and backwards, its deeper fibres are, in the Cat, inserted upon a cartilaginous rod representing the clavicle (*x*). Into the deeper surface of this are also inserted the fibres of the distinct *cleido-mastoid* element (*b*); the superficial fibres are, however, continued over the surface of this rod uninterruptedly into the arm by longitudinal fusion with the clavicular fibres of the *pectoralis major* (as STRAUSS-DÜRCKHEIM thinks), and blending finally with the superficial fibres of the *brachialis anticus*, are inserted with it into the ulna. In most of the Carnivora the clavicle is represented simply by a tendinous intersection on the deeper surface of the *cephalo-humeral* muscle. In this family the most striking development of the *cleido-occipital* is found in the peculiar arrangement, before alluded to, in the striped Hyæna, Polecat, and Genette, and to a less marked degree in the Coati, as figured in CUVIER and LAURILLARD'S 'Recueil.' A second clavicular head of the *cleido-occipital* crosses superficially over the *cleido-mastoid* to join the sternal origin of the *sterno-mastoid*, with the hinder border of which at the sterno-clavicular joint it is united, and not at all with the *cleido-mastoid*. Thus is produced an apparently double or second *sterno-cleido-mastoid* muscle, imbricated upon the true one, and strikingly resembling the human variety I have described in an earlier part of this paper. The Marmot shows a similar arrangement.

In the *Hyrax capensis*, which presents many points of connexion in its muscular system with the Rodents on the one hand, and the Pachyderms on the other, the arrangement of these muscles admits of the best reading, I believe, by the homologies herein indicated. As described by MURIE and MIVART, the *sterno-cleido-mastoid* apparatus is represented by three muscles:—One, attached to the occipital bone, and inserted with the *biceps* into the ulna, is the *cleido-occipital*, joining in the formation of a compound *cephalo-humeral* with some of the segregated fibres of the *pectoralis* and of the *brachialis anticus*. Another portion, the true *sterno-mastoid*, is connected above with the angle of the jaw and *masseter* (*sterno-maxillary* v. *mandibular* of the Ruminants and Pachyderms, see also MECKEL, Anat. Comp. t. vi. p. 163); below, it joins its fellow of the opposite side at and above the sternum. A third portion, a very slender muscle, somewhat resembling the *omo-hyoid*, is attached in front to the paramastoid process, and joins behind with the first on its deep surface: this third part, according to the homologies herein sustained, would be the true *cleido-mastoid* muscle, the name which is bestowed by MURIE and MIVART upon the first described portion (Proc. Zool. Soc. April 11, 1865, pp. 331, 332).

The limits of this paper will hardly permit me to follow further the various developments of the foregoing group of muscles in the Pachyderms, Ruminants, and the rest of the Mammalia. It will be enough for my purpose if I have succeeded in showing the more important forms which, when occurring as varieties in the human subject, tend to exhibit in a sufficiently marked manner what may be considered as proofs and examples of the Darwinian *principle of reversion*, or *law of inheritance*, in this department of anatomical science.

I will now proceed to consider another group of occasional varieties in the human shoulder, which I believe I was the first to connect with their homologies in the animal kingdom, and one of which, the *scapulo-clavicular*, I was the first to discover and name in the human subject.

*Sterno-chondro-scapular* and *Scapulo-clavicular* Muscles.—In my paper read before the Royal Society in 1864, I figured and described examples of an apparently double development of the *subclavius* muscle. The upper portion had the normal attachments of the *subclavius* muscle; the lower part, separated from it by a distinct areolar interval, somewhat wide externally, arose, in one case, by a distinct tendon from the sternum and first rib-cartilage, but, in another, in common with the *subclavius*. Passing outwards as a somewhat fusiform muscle over the axillary vessels and nerves, it was inserted fleshy into the tubercle of the coracoid process and conoid ligament. In my paper published in the 'Proceedings of the Royal Society' in 1865, I figured and described a similar muscle, found on the left side of a thin female subject (Plate IX. fig. 10, *i*). It was a roundish fusiform muscle, arising tendinous from the first rib-cartilage close to the sternum, and inserted into the suprascapular ligament and base of the coracoid process, where it was connected with the origin of the *omo-hyoid* muscle (*o*).

In the same shoulder a distinct band of muscular fibres, about an inch wide and an

eighth thick (*k*), arose from the base of the coracoid and suprascapular ligament, and passing upwards and forwards was inserted into the outer third of the clavicle (*x*), close to the *subclavius* muscle (*m m*); it was quite distinct from the first-described *sterno-scapular* muscle, but was connected with it to the origin of the *omo-hyoid*, which was normal in all other respects. In my paper of 1868 I noted another specimen of this formation on the left shoulder of a male subject. These abnormal human varieties, the *sterno-scapular* and *scapulo-clavicular* muscles, have been found in comparatively few subjects, partly, I believe, on account of the difficulty of preserving them entire in the ordinary way of apportioning the subject to different students, and the liability of the latter especially to be removed along with the fat and tissues which fill up the interval between the scapula, clavicle, and first rib when the vessels and nerves are dissected. I have therefore considered that any estimate of their frequency in the human subject would necessarily be a fallacious one.

The *sterno-scapular* muscle corresponds in most respects with the following abnormal muscular slips described by their observers under various names.

MECKEL described a double *subclavius* muscle, and compared it to the external and internal intercostals (Muskellehre, 1816). It had previously been described by BOEHMER as a muscle connected with the origin of the *subclavius*, and inserted into the coracoid or acromion (!) process (Observ. Anat. rar. præfat. Halle, 1756, p. ix); and also by HALLER as a double *subclavius* (De Corp. Hum. Fabr. t. v. part i. p. 95 *a*, and t. vi. p. 77, 1756); and by SÆMMERRING as a variety of the *omo-hyoid*, arising from the first rib and inserted into the scapula (De Corp. Hum. Fabr. t. iii. p. 173, 1796); and by ROSENMÜLLER, on the left side of a male subject arising from the rib-cartilage behind the *subclavius*, and inserted near the base of the coracoid process (Beiträge für die Zergliederungskunst, Bd. i. Heft 3, S. 375, Tab. ii., and 'De nonnullis Musculis,' 1814, p. 6).

R. WAGNER described it as a variety of the *omo-hyoid*, arising from the first rib-cartilage, and inserted into the *incisura scapulae* with the origin of the *omo-hyoid* (HEUSINGER'S Zeitschrift, Bd. iii. S. 335).

THEILE described a rounded muscle, arising from the first rib-cartilage, and inserted into the base of the coracoid and upper border of the scapula, in a male subject in whom the *omo-hyoid* was wanting. He considered it as a variety of the *serratus magnus* (SÆMMERRING'S Encyclop. Anat., JOURDAN'S Trans. p. 206, 1843).

MACWHINNIE quotes HALLER and SÆMMERRING as above (*op. cit.* p. 187). HALLETT describes as a variety of the *omo-hyoid* a considerable slip of muscle, connected by one tendon to the first rib-cartilage, and by another inserted into the upper border of the scapula with the origin of a normal *omo-hyoid* (*op. cit.* p. 4). GRUBER also describes a similar abnormality as connected with the *omo-hyoid* (Vier Abhand. 1847, and Neue Anomalien, 1849).

The *Scapulo-clavicular* variety I believe to be homologically identical with the muscular slips described by the following writers.

Von KRAUSE described, under the name of the *coraco-cervicalis*, a slip of muscle

arising with the *omo-hyoid* from the base of the coracoid process and upper border of the scapula, and inserted into the cervical fascia close to the scapula (quoted by QUAIN, 'Arteries,' pl. 4. fig. 21).

MACWHINNIE described a muscle as a variety additional to the *omo-hyoid*, arising from the scapula behind and internal to that muscle, forming a belly as thick as the little finger, and attached by a rounded tendon to the middle of the upper border of the clavicle (*op. cit.* p. 187).

HALLETT described a muscle arising from the upper border of the scapula with the *omohyoid*, and inserted into the upper part of the sterno-clavicular articulation. He also found other slips of the same general character (*op. cit.* p. 4).

LUSCHKA found a slip of muscle connected with the origin of the *omo-hyoid*, and inserted into the back part of the inner end of the clavicle, which he considered as a variety of the *omo-hyoid* (MÜLLER'S Archiv, 1856, S. 284). Similar slips are mentioned by HYRTL (Lehrbuch, S. 344) and by HENLE (*op. cit.* S. 116) as varieties of the *omo-hyoid*.

*Sterno-clavicular Muscle*.—In the 'Proceedings of the Royal Society' (June 21st, 1866, p. 238), I described under the above name (first given by Mr. BERKELEY HILL) an abnormal muscle found on the left side of a male subject (see Plate IX. fig. 9, *l*). It was triangular in shape, arising by a thin tendon from the front of the *manubrium sterni* just below the origin of the *sterno-mastoid*, formed a distinct muscular layer spreading upwards and outwards in a fan-shape under the *pectoralis major* (P), and separated from the *subclavius* (*m*) by the costo-coracoid membrane, and was inserted into the lower border of the clavicle about its middle third, passing as far outwards as the origin of the *deltoid* muscle. A *cleido-occipital* muscle (*c*) coexisted. On both sides of another male described in the same paper (p. 231) I found the upper digitation of origin of the *pectoralis minor* somewhat separated from the rest, and arising as high as the first intercostal aponeurosis, passing upwards to be inserted into the costo-coracoid membrane and clavicle. This was specified as a formation similar to a *sterno-clavicular* muscle, produced by a differentiation of the fibres of the *pectoralis minor*, as found in the Rodents.

A similar variety was recorded by HALLER (Elements of Physiology), and quoted by HENLE. THEILE also described as a variety of the *subclavius* a muscle arising from the first rib-cartilage, and inserted into the middle part of the front border of the clavicle (*op. cit.* p. 173). In May 1864 Mr. BERKELEY HILL described a well-marked specimen of this muscle under the above name, quoting HALLER, and pointing out its homology in the Bats and Birds (Proc. Royal Med.-Chirurg. Soc. vol. iv. No. 6, p. 351).

COMPARATIVE ANATOMY of the three foregoing varieties.—In the Coati (*Simia paniscus*) MECKEL describes a second insertion of the *subclavius* into the scapula (*sterno-scapular*), near the attachment of the *levator anguli scapulae*. This is quoted by R. WAGNER (*op. cit.* S. 336) as corresponding to the double *subclavius* in Man. In the Insectivora I have found a corresponding muscle distinctly marked in the Mole (Plate X. fig. 11, *i*), arising outside the true *subclavius* (*m*) from the sternum and first rib, separated from it by an areolar interval; it crossed the insertion of the *supraspinatus* (*q*), and was inserted into

the acromion process and *acromio-clavicular* ligament, where it was still more distinctly separated from the *subclavius*. In the same animal Mr. HILL found, as I have myself subsequently also done, a remarkable development of the *sterno-clavicular* muscle, as a large triangular mass of muscle arising from the front half of the sternum, and inserted into the stunted but strong clavicle close to the origin of the *deltoid*. The same author also mentions the presence of this muscle in the Bats.

A *sterno-scapular* muscle is described by Mr. GALTON in the *Dasypus sexcinctus* under the head of *subclavius*, arising from the first rib, and inserted by a flat tendon along the whole extent of the upper edge of the strong acromion process, and continuous with the supraspinous fascia. He refers to its similarity to the *sterno-scapular* muscle described by MIVART and MURIE in the Agouti (Trans. Linn. Soc. vol. xxvi. p. 528). He also found the *subclavius* inserted into the acromion process of the scapula in the Two-toed Sloth. In the Cape Anteater, HUMPHRY describes the *subclavius* as a large muscle arising from the first and second rib-cartilage and adjacent part of the sternum beneath the *pectorals*; it is attached by a few fibres to the clavicle, but the major part passes beneath that bone over to the coracoid and its ligaments to be inserted into the supraspinatus fascia, as well as to the margin of the acromion process (*op. cit.* p. 297, and plate 4). GALTON found, in the same animal, a sesamoid bone at the insertion of the muscle, just under the acromio-clavicular joint (*op. cit.* p. 572).

In the Carnivora the homologies of the *sterno-scapular* muscle are but little decided. In the Weasel a deeper set of the pectoral muscular bundles, arising from the manubrium, pass upwards and outwards over the tuberosity of the humerus, and are continuous with a muscular layer lying upon the *supraspinatus*, and attached with it to the upper border of the scapula (Plate XI. fig. 24, *i*). In the Dog also, a few of the fibres of the *pectoralis* are differentiated and connected with the *supraspinatus*. In CUVIER and LAURILLARD'S plates of the Lion, it seems to be represented by the muscle marked J, and in that of the Panther marked J+2. In the Hyæna it is very large, attached, on the one hand, to the sternum and first rib-cartilage, and on the other to the upper border of the scapula (*j*+). It seems also to be present in the Genette. In the Rodents it is better marked, blended, however, more or less, with the *subclavius*, the *scapulo-clavicular*, and the *sterno-clavicular* muscles. I have found it very large in the Rabbit (Plate X. fig. 16, B, *i*''), arranged in two thick bundles, an upper (*i*) and a lower (*i'*) passing from the front of the *manubrium sterni* and *suprasternal* process, and continued uninterruptedly under the clavicle, forming a thick sheet of muscle upon the *supraspinatus* (*q*) to be inserted into the upper border of the scapula. Connected with it and covering its upper half above the clavicle is a layer of fibres (A, *k*), reaching only from the scapular spine to the clavicle (*x*), into the upper border of which they are inserted. This layer, more or less separable from the deeper or true *sterno-scapular* fibres, I have considered to represent the *scapulo-clavicular* muscle, which becomes a more distinct muscle in its congeners, the Guinea-pig and Norway Rat (Plate X. fig. 17, A & B, *k*, and Plate XI. fig. 25, *k*). On the opposite or lower border of the clavicle are attached the



fibres of insertion of a broad triangular muscular layer (Plate X. fig. 16, *l*), arising from the sternum under the *pectorals*. This is clearly the homologue of the *sterno-clavicular* muscle, disguised by its connexion with the *sterno-scapular*.

The group of muscles just described have been taken together as one *m. pectoralis minor* by KRAUSE (*op. cit.* S. 104), and as the *subclavius* by CUVIER (Recueil, pl. 233), but the interposition of the clavicle between the upper and lower portions of the deeper layer points evidently to their correspondence, respectively, to the *scapulo-clavicular* and *sterno-clavicular* of other animals; and they are, at least, as worthy of separation as the component parts of the *cephalo-humeral*, as distinguished by the same bone or its tendinous representative. Another portion of the pectorals of the Rabbit answer more closely than these to the *pectoralis minor* of Man.

The *sterno-scapular* muscle in the Guinea-pig (Plate X. fig. 17, A & B, *i*) corresponds with a *subclavius* in being attached to the movable clavicle (*x*) by its more superficial fibres, while the deeper are continued to the outer part of the spinous process of the scapula, where it is inserted between the *supraspinatus* (*q*) and *infraspinatus*. In the same animal the *scapulo-clavicular* muscle (*k*) is very considerable in size and distinct from the *supraspinatus*, over which it moves freely; arising from the scapular spine and supraspinous fascia, internal to the last, and inserted into the movable clavicle (*x*) opposite to the *sterno-clavicular* (*l*). This last-named muscle arises from the middle of the sternum, between and partly covered by the upper and lower fibres of the pectorals, forming a triangular layer very distinct in its origin and insertion. In the Norway Rat (Plate X. fig. 19, & Plate XI. fig. 26) the *subclavius* proper (*m*) is represented by a small bundle of fibres arising to the inner side of the *sterno-scapular*, and inserted into the lower surface of the inner end of the clavicle (*x*). The *sterno-scapular* is a fusiform muscle (*i*) ending in two tendons of insertion, one with the *omo-hyoid* into the cervical border, and the other into the acromion process of the scapula. The *scapulo-clavicular* (*k*) in the same animal is very distinct, arising from the middle of the supraspinous fascia, and inserted into the outer end of the clavicle (*x*). This bone articulates directly both with the sternum and scapula, so that the action of the muscle upon it presents nearly the same conditions as in the human subject, and is necessarily more limited than in the Rabbit and other semiclavicate animals.

The *sterno-scapular* muscle has been described by MURIE and MIVART in the *Hyrax capensis* as arising from the sternum in front of the origin of the *pectoralis minor*, and continued over the shoulder articulation to its insertion into the anterior superior angle of the scapula (*op. cit.* p. 338). They also found it in the Guinea pig, together with a slip from the *supraspinatus* to the clavicle (*scapulo-clavicular*), and state that MECKEL describes it as a part of the *subclavius* in the Hare, Porcupine, and Agouti (pp. 259, 260), and that CUVIER considered it as part of the *trapezius*? (Leçons, vol. i. p. 373). In the 'Recueil de Planches' it is marked in the Rabbit as *subclavius* (pl. 233). In the Crested Agouti, MIVART and MURIE found the *sterno-scapular* to have a double origin, viz. a larger, from the sternum between the pectoral bundles; and a smaller, from

the manubrium and first rib. Some of the fibres of the larger origin are connected with the clavicle (*sterno-clavicular*), and the rest of them join the smaller origin under that bone, to be inserted near the anterior vertebral angle, and into the supraspinous fascia of the scapula. In the Hare they found one broad sternal origin and a very wide scapular insertion, extending along the whole cervical border, some of them adhering to the outer end of the rudimentary clavicle (*subclavius* or *sterno-clavicular*) (Proc. Zool. Soc. June 1866, p. 398). In CUVIER and LAURILLARD'S plates of the Porcupine (pl. 229. fig. 2) the *sterno-scapular* muscle, marked as a *subclavius*, is very long, and passes outward to the scapular spine. MACALISTER has also found it in this animal (*op. cit.* p. 11). In the plates of the Capybara, Paca, and Squirrel, the same muscle, or the *sterno-clavicular*, is marked as a deeper portion of the pectorals. In the common Squirrel I have found it as a distinct muscle, passing under the clavicle to the scapular spine and suprascapular fascia (Plate X. fig. 18, *i*). The *sterno-scapular* muscle receives its highest development in the Pachyderms and Ruminants, and especially in the Elephant, Hippopotamus, Peccary, Pig, Horse, and Ass (Plate XI. figs. 20 & 21, *i*), to whose heavy bodies it forms a powerful, muscular, sling-like support, upon and between the fore legs, reversing its "*point d'appui*" as compared with its action in the animals before described, in whom its power is exercised chiefly in the direction of the fore limbs. In these heavier animals its arrangement scarcely calls for a more detailed description in this place. In his monograph upon the Hippopotamus, GRATIOLET describes the muscle as the *scapulo-sternal*, arising from the coracoid and acromion processes and the *supraspinatus* fascia, and inserted into the *manubrium sterni* and first costal cartilage. He considers it as probably the homologue of the *subclavius* (p. 256).

In the Marsupials, a muscle answering to it is represented by CUVIER and LAURILLARD in their plates of the Great Kangaroo, Kangaroo-Rat, and Sarigue, connected with the scapula and *supraspinatus* fascia. GALTON mentions that in the Wombat a portion of the *subclavius* muscle is carried on through the *supraspinatus* fascia to the scapular spine; and that the notes of a MS. work in the Oxford Museum describe in the same animal a second head of the *subclavius*, "a very delicate one arising from the lower ribs and passing vertically upwards to end in a fine tendon." MIVART describes a muscle passing from the sternum to the coracoid bone in the *Iguana tuberculata* (Proc. Zool. Soc. 1867, p. 779).

The *Scapulo-clavicular* muscle is described and figured in CUVIER and LAURILLARD'S plates of the Rat-mole of the Cape (pl. 216+) with the following annotation:—"Dans ces notes marginales," M. CUVIER dit, "Il existe un muscle particulier allant de la portion moyen de l'omoplate à la clavicle, où il s'insère derrière la deuxième portion claviculaire du trapèze, ou pourra l'appeler 'sus-clavier' ou 'scapulo-clavier.'" They also describe and figure, under the same names and nearly the same terms, a like muscle in the Sarigue (*Didelphis marsupialis*).

On a review of this group of muscles in the foregoing animals, the *sterno-scapular* muscle seems, in many instances, to embody the fibres of the *subclavius*, and in others

to be made up chiefly by the union, at the imperfect clavicle or its tendinous representative, of a *sterno-clavicular* and a *scapulo-clavicular* element.

In the heavier animals, in whom the clavicle is altogether wanting, it constitutes a continuous muscular support to the trunk upon and between the scapulæ, uninterrupted by the intervention of a clavicular representative, and embodying all the various elements. In animals possessed of a clavicle, and using the fore paws as hands, the distinction of the *sterno-clavicular*, *subclavian*, and *scapulo-clavicular* elements becomes more marked; while in some, like the Rabbit, a combination of all these is evident in the compound muscular mass. In the Guinea-pig the *sterno-clavicular* and *scapulo-clavicular* are large and distinct muscles, while the *sterno-scapular* is also very distinct and separate from them. In the Norway Rat the *subclavius* and *sterno-scapular* are distinct, and the *scapulo-clavicular* well marked, while the *sterno-clavicular* seems altogether wanting. The last-named element seems to be the most marked in Mammalia of burrowing and flying habits, and it draws powerfully the primary segment of the fore limbs, chiefly used in these motions, backwards against the resisting and reacting atmosphere. All these modifications are evidences of teleological adaptations of a common morphological structure, such as we find prevailing in other parts of the animal organization.

*Supracostal Muscle.*—An abnormal and infrequent variety in the human subject was first recorded and described by me in the ‘Proceedings of the Royal Society’ of 1865. It occurred, on both sides, in a muscular male subject, in whom a *levator-claviculæ* and thirteen other abnormalities were found (see Plate IX. fig. 8, n). It was a thin, flat, ribbon-shaped muscle, placed upon the upper four ribs, between the digitations of the *pectoralis minor* and those of the *serratus magnus*. It was attached above to the outer edge of the first rib near its cartilage, by a fleshy attachment about an inch broad, passing downwards and slightly forwards; the fibres gradually spread out in somewhat of a fan-shape, and dropped insertions into the outer surfaces of the second, third, and fourth ribs, close to the origin of the *pectoralis minor*. It was entirely distinct from the intercostals, from which a well-marked fascia separated it.

In the ‘Proceedings of the Royal Society’ of 1867 I recorded another specimen, found also in a male subject, and on both sides. It was attached above to the first rib, as in the first case, and was connected also externally to the cervical fascia covering the *scalenus anticus*, with which it seemed to be in part continuous. Below it was attached to the *third* rib only, in front of the *serratus magnus*. Since that time we have found another specimen of this muscle, also in a male, and on both sides.

MR. MACALISTER has found this muscle several times, very large and muscular. In a male subject it existed on the left side only, attached above wholly to the cervical fascia, and below to the third and fourth ribs, about  $6\frac{1}{2}$  inches from the sternum, in the same situation as the foregoing. He has found it usually narrower and thicker on the right side than on the left. In one instance it measured  $3\frac{3}{4}$  inches long,  $\frac{3}{4}$  inch wide, and  $\frac{1}{8}$  inch thick, overlapping the upper digitations of the *serratus magnus*, and ascending behind the axillary vein, was attached on the right side to the first rib, and on the left into the

cervical fascia only. It lay considerably external to the origin of the *lesser pectoral* muscle, and was inserted internal to the *scalenus anticus*. Mr. MACALISTER considered it as acting from below upon the cervical fascia above (Notes on Musc. Anomalies, p. 7). He states that the muscle occurs in the *Balænoptera rostrata*, in the Seal, and in several Monkeys.

Professor TURNER, of Edinburgh, has also met with this muscle in two male subjects; in one on both sides, and in the other on the right side only. In the former it consisted of a long, ribbon-shaped muscle attached by a thin expanded tendon to the upper border of the fifth rib, immediately internal to the *serratus magnus*. The innermost part of this attachment was continuous with the intercostal fascia, and was attached to the rib at its junction with the cartilage. From the anterior surface of the fourth rib, close to the origin of the *serratus magnus*, a second and smaller origin proceeded. The muscle passed over the third and second ribs to be attached to the first rib immediately external to the tendon of origin of the *subclavius*. It was 6 inches long and  $\frac{5}{8}$  of an inch broad at its widest part. In the subject in which the muscle was found on the right side only, it was attached to the upper border of the fourth rib, 2 inches external to the junction with the cartilage, ascended over the third and fourth ribs, and was attached above to the first rib  $\frac{3}{4}$  of an inch outside the origin of the *subclavius* (Journal of Anatomy and Physiology, May 1867, p. 251; and May 1868, p. 393, and figure). In the Liverpool Medical and Surgical Reports, October 1867, Dr. ROBERTS describes one of these muscles extending from the fourth to the first rib; and in VIRCHOW'S 'Archiv,' November 18th, 1867, one is described by BOCHDALEK, Jun., under the name of "*supracostalis anterior*," and another by PYE-SMITH in No. XLIII. of the same Journal (p. 142).

COMPARATIVE ANATOMY.—Professor TURNER considers the *supracostal* muscle described by me to be the homologue of the thoracic prolongation of the mammalian *rectus*, which in the Cat, Otter, Beaver, Porcupine, and various other Mammalia reaches as far forwards as the first rib. But, as this accurate observer proceeds to say, "In these animals, however, the thoracic and abdominal parts of the *rectus* are directly continuous with each other, whilst in the human subject a break, corresponding in the first specimen to the fifth rib, and in the second to the fifth rib and fourth intercostal space, occurred; but this break may be regarded as comparable to one of those transverse tendinous intersections invariably found in the abdominal portion of the human *rectus abdominis*, and which exists also in the recti of the greater number of Mammalia." In his first paper "On the *Musculus sternalis*" (*op. cit.* 1867, p. 250) this author alludes also to a muscle described by BOERHAAVE and PORTAL, which was directly continuous with the thoracic attachment of the *rectus abdominis*, as undoubtedly to be regarded as the homologue of the anterior fibres of the mammalian *rectus*. In the case recorded by BOERHAAVE it reached behind the great pectoral muscle as high as the junction of the third rib with its cartilage, and in that described by PORTAL as high as the second rib. This latter muscle is, however, evidently a formation distinct from the *supracostalis*, which pertains rather to the upper part of the thorax than to its abdominal portion.

There is another muscle, almost universal in the Mammalia, which may be considered perhaps to be a part of the same apparatus as the *rectus* muscle; but which is confined, even in the most highly developed instances, to the upper part of the thorax. It is described by CUVIER under the name of the *sterno-costalis*. In many respects this muscle agrees better in its homological bearings with the abnormal human *supracostalis* than the *rectus thoracicus* does. Besides being confined to the upper part of the thorax, the upper attachment of the muscle is always in close relation to the insertion of the *anterior scalenus*, as in the human abnormality. This is well seen in the Dog (Plate XI. fig. 27, *n*), where it is connected below, not to the sternum as in many Mammalia, but to the second and third costal cartilages and intercostal aponeurosis, and does not reach anywhere near the insertion of the *rectus abdominis*. The same arrangement is found also in the Badger. In the Rabbit the muscle is short, but broad, and reaches from the first rib and to the cartilage of the second rib, extending inwards as far as to the sternum (see Plate X. fig. 16, B, *n*); while the *rectus thoracicus* reaches only up to the second rib, the most common upward limit in the Mammalia generally. It is not mentioned by KRAUSE in his description of this animal. In cases in which the *rectus* extends to the first rib, the *sterno-costal* muscle usually overlaps it (see figs. 18 & 26, *n*), assuming an oblique position on the thorax. It is always attached to the first rib close to the inner side of the origin of the *scalenus anticus*, and thence passes obliquely downwards and inwards between the upper end of the *rectus thoracicus* and the pectoral system of fibres, the *pectoralis minor* and *sterno-clavicular* both lying superficial to it. The *rectus thoracicus* itself is attached to the first rib and its cartilage, always closer to the sternum, and much internal to the upper attachment of the *sterno-costal*, and never has so intimate a relation with the *scaleni* as the last-named muscle. In this respect especially the human *supracostal* muscle resembles the *sterno-costal* of animals much more than the *rectus thoracicus*. In the Mammalia generally the *sterno-costal* is a more or less triangular muscle, but sometimes tapers off below before it joins at the sternum with the deeper pectoral fibres, of which it always forms the deepest layer. It is covered by a fascia derived from that of the *rectus thoracicus* and *intercostals*. In the Quadrumana the *sterno-costal* is usually large. In the Bonnet-Monkey it reaches and crosses the upper part of the *rectus thoracicus* as low down as the second and third rib (see Plate X. fig. 12, *n*). In the Magot it is enormous, as figured by CUVIER and LAURILLARD, arising by digitations from the three upper ribs, and passing downwards and inwards to the three upper pieces of the sternum. In the *Papio Mormon* it is attached to the first rib above, and below to the second and third costal cartilages. In the Marmoset and *Lemur macaco* it arises from the first rib close to the *scalenus*, and crosses, as in the Carnivora generally, the upper fibres of the *rectus thoracicus*. It is found in the Hedgehog and Tenrec; and according to CUVIER, in the Black Bear, Coati, Panther, Lion, Hyæna (very large), Badger, Genette, Seal\*, and Polecat. In the Panther a slip of

\* In his paper on the Myology of the Cape Anteater and Seal, Professor HUMPHRY describes, in the latter animal, under the name of the *subclavius*, a muscle "thin from the margin of the sternum opposite the second,

muscle from the *scalenus* joins it. I have also found it in the Weasel and Badger, Dog (fig. 27), and Cat. In the Rodents CUVIER figures it in the Marmot, Beaver, Porcupine, and Agouti. It is not mentioned by MIVART and MURIE in the latter animal. I have found it long, well marked, and overlapping the rectus in the Norway Rat and in the Squirrel, connected with the first rib between the *subclavius* and *scalenus*, crossing the upper part of the *rectus*, which reaches to the first rib, and reaching far down the sternum to join the pectoral fibres arising from that bone (Plate X. fig. 18, n). In CUVIER and LAURILLARD'S plates it seems to be the muscle marked as the lower part of the *scalenus*, and figured as a very large muscle in the *Bradypus tridactylus* and Tamandua, reaching from the first rib to the eighth, between the pectorals and *serratus magnus*. In MECKEL'S description of the Two-toed Anteater, he describes a long muscle arising from the first rib, and inserted into the front part of the ninth, tenth, and eleventh, under the name of "der kleiner Brustmuskel," stating expressly that it is *not* attached to the scapula, but that it seems to be an elongation of the *external intercostal* (Archiv, Bd. v. Hft. i. p. 41, c). This is evidently a muscle of the same nature as our human *supracostalis*, and agrees more with the *sterno-costal* of the other Mammalia than with the *rectus thoracicus*, which is coexistent and well developed in the same animal. The same muscle is figured in this animal by CUVIER and LAURILLARD (pl. 257. figs. 2 & 6) as the *anterior scalenus*; but as it commences clearly at the first rib, and does not ascend into the neck, it cannot be admitted as entitled to this name.

In the Elephant the *sterno-costal* muscle seems to be represented, according to the same authorities, by a large muscle, attached on the one hand by three digitations to the first rib, and on the other to the side of the upper pieces of the sternum, reaching as low as, but not overlapping, the upper insertion of the *rectus abdominis*. By some this may be considered as a *rectus sternalis* with an interruption of the nature of a tendinous "inscription;" but the appearance of the muscle agrees best with that of the *sterno-costalis*, while a tendinous separation or interval between the *rectus thoracicus* and the *rectus abdominis* is not usually seen in the Mammalia. In the Peccary it is composed of two large digitations quite unlike a *rectus sternalis*; and in the Pig, the anterior fibres of the most anterior intercostal muscle cross superficially over the second rib-cartilage to be inserted into the sternum below it, showing a feeble development of the *sterno-costalis* or *supracostalis* muscle. In the Ass the muscle is represented by one digitation only.

Upon the whole it seems to me that the balance of facts is more in favour of the identity of the human abnormal *supracostalis* muscle with the *sterno-costalis* of the Mammalia, than with the *rectus thoracicus* of these animals, as in the homology proposed by Professor TURNER. Finally, I would refer to the same *supracostal* or *sterno-costal*

third, and fourth ribs, and inserted into the edge of the *first rib* near the point corresponding to the insertion of the *scalenus anticus* in Man. The artery of the fore limb crossed its insertion. It was in close contact with the *scalenus*, indeed some of its fibres joined that muscle" (*op. cit.* p. 297 and pl. 6). This description clearly answers to the *sterno-costal* muscle figured by CUVIER and LAURILLARD in the same animal.

homologue the muscular slip described and figured from the Crocodile by Professor ROLLESTON, in his valuable memoir on "The Homologies of certain Muscles connected with the Shoulder-joint" (p. 626 and fig. 3, *e, i*), as "a muscular fascicle which arises from the second *sterno-costal* cartilage in the same series as the external oblique and intercostals, but which may also be looked upon as homologous with an anterior segment of the *rectus abdominis*, which is often not distinguishable from the former of these muscles. It ends in a delicate tendon, which loses itself along the coracoid groove in the sternum and the origin of the *pectoralis major*."

#### EXPLANATION OF THE PLATES.

For the sake of convenient reference the letters of each figure point out the same or homologous muscles, &c.

- a. Sterno-mastoid; a', sterno-mandibular or maxillary* of veterinary anatomists.
- b. Cleido-mastoid.*
- c. Cleido-occipital, second cleido-mastoid* of MECKEL and CUVIER; *trapezius clavicularis* of the latter and other authors.
- d. Occipito-scapular. Rhomboideus capitis; rhomboïde de la tête* of CUVIER; *rhomböide antérieur* of MECKEL; *levator scapulæ minor vel posterior* of DOUGLASS and BURMEISTER.
- δ. Homologous slip of the last named.*
- D. Deltoid.*
- e. Levator claviculæ* of HUXLEY; *acromio-trachélien* of CUVIER; *omo-trachélien, acromio-basilar* of VICQ D'AZYR; *levator scapulæ major v. anterior* of DOUGLASS and BURMEISTER; *transverso-scapulaire* of STRAUSS-DÜRCKHEIM; *clavio-trachélien* of CHURCH; *omo-atlanticus* of HAUGHTON.
- ε and η. Homologous slips of the preceding connected with the levator anguli scapulæ and the serrati respectively.*
- f. Levator anguli scapulæ.*
- F. Abnormal slips of ditto.*
- g. Adjutor splenii* of WALTHER; *rhombo-atloid* of MACALISTER.
- h. Splenius capitis.*
- h'. Splenius colli.*
- i. Sterno-scapular; subclavius* of MECKEL and CUVIER; *pectoralis anticus* of veterinary anatomists.
- j. Scalenus anticus.*
- j'. Scalenus posticus or medius.*
- k. Scapulo-clavicular; scapulo-clavien* of CUVIER; part of *sterno-scapular, subclavius* or *supraspinatus* of other writers.
- l. Sterno-clavicular; pectoralis minor* of some authors.

- m. Subclavius.*  
*n. Supracostalis* or *sterno-costalis*; the *rectus thoracicus* of TURNER.  
*o. Omo-hyoid.*  
*P. Pectoralis major.*  
*p. Pectoralis minor.*  
*q. Supraspinatus.*  
*R. Rhomboideus major.*  
*r. Rhomboideus minor.*  
*Rt. Rectus thoracicus*; continuation of *rectus abdominis*.  
*S. Serratus magnus.*  
*s. Serratus posticus superior.*  
*T. Trapezius.*  
*t. Subscapularis.*  
*u. Rectus capitis anticus major.*  
*v. Rectus capitis anticus minor.*  
*w. Rectus lateralis.*  
*x. Clavicle*, or its rudimentary representative, or tendinous "inscription."  
*y. Tuberosity of the humerus.*  
 3. Acromion process, or spine of scapula.  
 z. Metacromion process of scapula.  
 1. Transverse process of the atlas.  
*b c. Levator humeri*, lower part of *cephalo-humeral* of some writers, when formed by the *cleido-mastoid* (*b*) and *cleido-occipital* (*c*) above, with the clavicular fibres of the *deltoids* (D) or *pectoralis major* (P) below.  
*b e.* The same compound muscle, when formed above by the *cleido-mastoid* (*b*) and the *acromio-trachélien* or *levator claviculæ* (*e*), and by the same muscles below.  
*θ.* An abnormal anomalous muscular slip connected with the *rhomboideus major*, found only in one subject (male).

## PLATE IX.

- Fig. 1. Back view of the muscles of the human shoulder in a male subject, showing the *occipito-scapular* variety (*d*) on the right side.  
 Fig. 2. Back view on both sides, showing varieties homologous with the *occipito-scapular* (*d, d*), and one other anomalous slip (*θ*) of *rhomboideus major* (R).  
 Fig. 3. Back view on left side, showing homologous *occipito-scapular* (*δ*) and two slips (*ε* and *η*) from *levator anguli scapulæ* (*f*) to *serratus magnus* (S) and *serratus posticus superior* (*s*).  
 Fig. 4. Back view on left side, showing slips (*ε* and *η*) of *levator anguli scapulæ* (*f*) to *serratus posticus superior* (*s*) and *serratus magnus* (S).  
 Fig. 5. Back view on right side, showing homologous slips (*ε* and *η*) to the same muscles from the front surface of *levator anguli scapulæ* (*f*).



- Fig. 6. Back view on right side, showing homologous slip ( $\eta$ ) in front of *levator anguli scapulæ* ( $f$ ) to *serratus magnus* ( $S$ ).
- Fig. 7. Back view on left side, showing slips ( $F$ ) of *levator anguli scapulæ* ( $f$ ) to *serratus magnus* ( $S$ ) and *rhomboideus minor* ( $r$ ).
- Fig. 8. View of dissection of the left side of the neck and thorax of male subject, showing *levator claviculæ* ( $e$ ) and *supracostalis* ( $n$ ) muscular varieties.
- Fig. 9. View of dissection of the left side of the neck and thorax of male subject, showing the *cleido-occipital* ( $c$ ) and *sterno-clavicular* ( $l$ ) muscular varieties.
- Fig. 10. View of dissection of the right side of the neck and thorax of a female subject, showing the *sterno-scapular* ( $i$ ) and *scapulo-clavicular* ( $k$ ) muscular varieties.

## PLATE X.

- Fig. 11. View of the dissection of the right side of the neck- and shoulder-muscles of the common Mole (*Talpa europæa*), showing *cleido-occipital* ( $c$ ), *occipito-scapular* ( $d$ ), *splenius capitis* ( $h$ ), and *sterno-scapular* ( $i$ ).
- Fig. 12. View of the dissection of the left side of the Bonnet-Monkey (*Macacus radiatus*), to show *cleido-mastoid* ( $b$ ), *cleido-occipital* ( $c$ ), *levator claviculæ* or *acromio-trachélien* ( $e$ ), and *supracostalis* or *sterno-costalis* ( $n$ ). The clavicle ( $x$ ) is disarticulated from the sternum and turned back with the scapula and muscles.
- Fig. 13. Front view of the dissection of the muscles of the prævertebral muscles of the Rabbit (*Lepus cuniculatus*), to show the cranial attachments of the *cleido-mastoid* ( $b$ ), *levator claviculæ* ( $e$ ), and their relation to the *rectus capitis anticus major* ( $u$ ) and *minor* ( $v$ ).
- Fig. 14. View of the dissection of the neck- and shoulder-muscles of the right side of the Badger (*Meles taxus*), to show *cleido-mastoid* ( $b$ ), *cleido-occipital* ( $c$ ,  $c'$ ), *occipito-scapular* ( $d$ ), *acromio-trachélien* ( $e$ ), *levator humeri* ( $b c$ ), and the slip homologous to the upper digitation of the human *levator anguli scapulæ* ( $f$ ).
- Fig. 15. View of the dissection of the same muscles on the left side of the Weasel (*Mustela vulgaris*), to show the same muscles indicated by the same letters.
- Fig. 16. Dissection of the neck- and shoulder-muscles of the right side of the Rabbit.
- A. The muscles "in situ" to show those homologous to the two foregoing, marked by the same letters, with the addition of the *scapulo-clavicular* ( $k$ ) and the *sterno-clavicular* ( $l$ ) attached each to the clavicle ( $x$ ).
- B. The scapula of the same side turned over with its muscles attached, to show the double *sterno-scapular* muscle ( $i i'$ ) as seen from the deep surface, passing under the clavicle ( $x$ ). It also shows the *sterno-costalis* muscle ( $n$ ).
- C. View of the deep or under surface of the clavicle ( $x$ ), and *sterno-clavicular* ligament ( $x'$ ), showing the attachment of the *sterno-clavicular* muscle ( $l$ ) below, and the *levator humeri* ( $b c$ ) turned up.
- D. View from the superficial aspect of the same, showing the relative

attachments to the clavicle (*x*) and sterno-clavicular ligament (*x'*) of the following muscles, viz. *scapulo-clavicular* (*k*), the *cleido-mastoid* (*b*), the *cleido-occipital* (*c*), the *levator humeri* (*b c*) (clavicular fibres of the *pectoralis major* of the human subject), and the *sterno-clavicular* (*l*), including the *subclavius*.

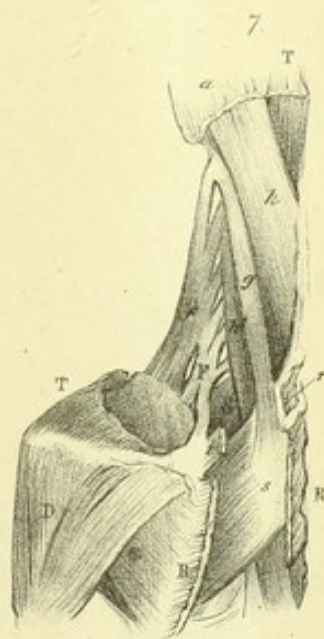
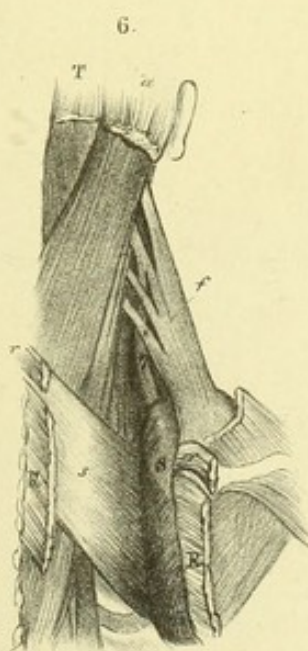
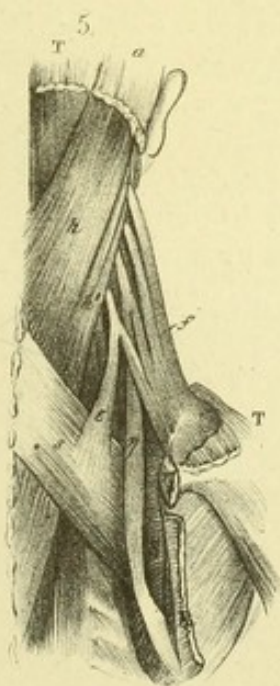
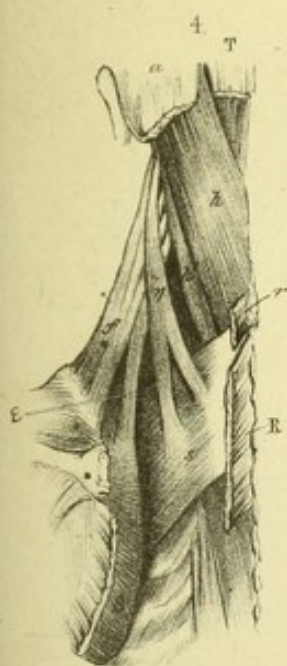
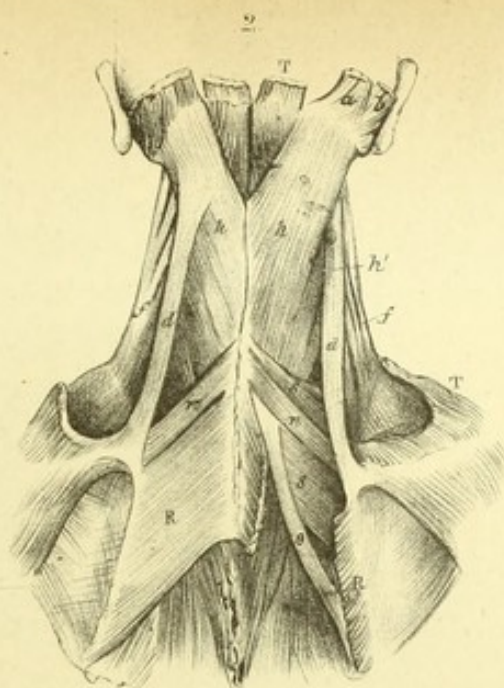
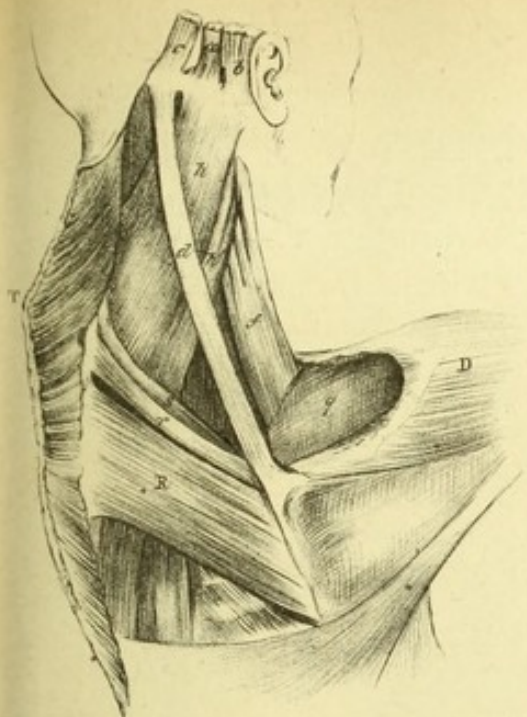
- Fig. 17. Front view of the dissection of the muscles of the neck and shoulder of the Guinea-pig (*Cavia vulgaris*). A, the muscles "in situ," the lettering corresponding to the foregoing. B, the right scapula and its muscles with the rudimentary clavicle (*x*), detached from the trunk, dissected out and turned back.
- Fig. 18. Right side view of the same muscles of the Squirrel (*Sciurus vulgaris*) with corresponding lettering, showing also the *sterno-costalis* muscle (*n*).
- Fig. 19. Right side view of the corresponding muscles, with the same lettering, of the Norway Rat or Surmulot (*Mus decumanus*).

### PLATE XI.

- Fig. 20. View of the left side muscles, taken from a dissection of a fawn of the *Fallow Deer*. *a*, *sterno-mandibular* (v. *maxillaris*) dividing into two slips, one (*a'*) to the angle of the lower jaw, and the other (*a'*) to join the homologue of the *cleido-mastoid* (*b*) and the *rectus capitis anticus major* (*u*), and to be attached with the latter to the basilar of the occipital, as seen in the Rabbit (in fig. 13); *e*, the *acromio-trachélien* attached to the transverse process of the atlas (1), and forming, with *b*, the *levator humeri* (*b e*). The figure also shows the *sterno-scapular* muscle (*i*).
- Fig. 21. View of the right side muscles of the neck and shoulder of a *Donkey*. The lettering refers to muscles corresponding to those of the last figure. The *cleido-mastoid* (*b*) passes, in this animal, to the mastoid process with the fibres of the *rectus lateralis* (*w*), instead of joining those of the *rectus anticus major* (*u*).
- Fig. 22. Front view of the muscles of the right side of the neck and shoulder of the Hedgehog (*Erinaceus europæus*). The lettering refers to the homologous muscles of the preceding. The *acromio-trachélien* (*e*) is here seen to form the *levator humeri* alone, and by its relation to the clavicular fibres of the *deltoid* (D) to foreshadow the closer union of these muscles which occurs in the two preceding figures. 1, the transverse process of the atlas.
- P. Sternal fibres of *pectoralis major*. P'. Clavicular fibres of the same muscle, showing at their origin a close homology with the *levator humeri* (*b c*) in the next figure of the domestic Cat.
- Fig. 23. Right side view of the corresponding muscles of the domestic *Cat*, with the same lettering. X shows the position of the rudimentary clavicle, covered by the fibres of *b* and *c*, which form below the *levator humeri* (*b c*).

- Fig. 24. Front view of the right shoulder-muscles of the *Weasel*, detached from the trunk and dissected.
- Fig. 25. Front view of the same parts in the Norway Rat (*Mus decumanus*).
- Fig. 26. Front view of the right neck- and shoulder-muscles in the same animal, drawn while still attached to the trunk, to show the relations of the *sterno-mastoid* (*a*), the *cleido-mastoid* (*b*), and the *cleido-occipital* (*c*), at their attachment to the clavicle (*x*) (which is cut in the middle, and the outer end thrown back), with the fibres of the *subclavius* (*m*) and the *sterno-scapular* (*i*) (the latter sending one slip to the acromion and another to the cervical border of the scapula). The figure also shows the *sterno-costalis* muscle (*n*) arising, close to the latter, from the first rib, and its relation to the *rectus thoracicus* (Rt) and the *scalenus medius* (*j*).
- Fig. 27. Front view of the muscles on the left side of the thorax of the Dog, showing the *sterno-costalis* or *supracostalis* muscle (*n*), and its relation to the *scalenus anticus* (*j*), the *scalenus medius* (*j'*), and the pectorals (*P* and *p*).
- Fig. 28. Diagram of the muscles of the *scapulo-clavicular* arch and the *sterno-costalis* treated of in this paper, showing their relative positions to each other.
- Fig. 29. Remarkable formation of the *cleido-occipital* variety (found in two male subjects in the dissecting-rooms of King's College, in one on both sides, and in the other on the left side only) strongly resembling the formation of the homologous muscle in the striped Hyæna, Polecat, Genette, Coati, and Marmot, as given in CUVIER and LAURILLARD's plates.

All the figures in the Plates were drawn by the author from his own dissections, except figs. 2 to 6 inclusive, which were sketched from nature by Mr. J. B. PERRIN, and figs. 20 & 21, which were sketched in the same manner by Mr. NETTLESHIP.



8.

9.

10.

