tain point advantageous to the individual in performing his particular form of labour.

When the normal mechanical condition of the body is altered, the transmission of the body weight alone may be sufficient to produce ossification of the ligaments, which sustain an abnormal amount of weight habitually. For instance, in more than one well-marked example of dorsal excurvation acquired early in life, I have found a good-sized piece of bone in the hypertrophied ligamentum nuchæ, as well as considerable prominence of the bony attachment of that ligament to the occiput.

THE POSITION OF THE MAMMALIAN LIMB, REGARDED IN THE LIGHT OF ITS INNERVATION AND DEVELOPMENT.¹

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Introduction.—In its earliest condition the mammalian limb shows no signs of segmentation. The bones and joints, muscles, and vessels, are developed from mesoblast formed *in situ*, and are primarily distinct and separate from the segmented trunk. The nerves alone are segmental, and they moreover precede, in order of time, the development of muscle and skeleton. From a consideration of the nerves, we can form an estimate of the position of the limb and its relation to the trunk. The nerves in a sense represent segments. The limbs are outgrowths corresponding to the ventral and lateral portions of the cylindrical trunk, as seen by their innervation,—from the whole of the inferior primary divisions concerned, and not the lateral branches alone.

Position of the Fore Limb.—In mammals, the fore limb has a fairly constant position, and the exceptions are nearly all alike. The proximal end of its postaxial border corresponds to the first thoracic segment, and is innervated by the first thoracic nerve in nineteen out of twenty-five cases. In six cases the second thoracic segment is implicated. The latter cases point to a tendency on the part of the limb to shift backwards. The preaxial border varies in different cases, extending forwards more or less towards the head. This view is supported by abnormal cases in man, by cases like the manatee, with an abnormal number of cervical vertebrae, and by the condition of things met with in birds. In birds, Fürbringer shows there is a tendency towards a shifting of the fore limb in a caudal direction.

Position of the Hind Limb.—The position of the hind limb varies more in relation to the axial skeleton than that of the fore limb. The postaxial border, reckoned by the position of the last nerve entering the great sciatic nerve (*n. bigeminus* of Ihring), corresponds to one of four segments—second sacral, first sacral, last lumbar, or third sacral. In only two cases was the third sacral segment found—man and the ass. The adult position of the limb does not always correspond with the developmental position; for example, in the porcupine the last nerve to enter the sacral plexus is the last lumbar. In most cases the limb remains in direct connection with the segments with which it is developmentally connected. In these cases in which the limb girdle is articulated with segments behind those with which it is developmentally associated, the inference is that the limb has shifted backwards in process of development. In those cases in which, as in the ass, the number of sacral nerves entering the sacral plexus exceeds the number of “true” sacral vertebrae, the inference is that the limb has shifted forwards, so as to become attached to segments placed anteriorly. This view is supported by: 1. Cases of increase or diminution in the number of thoracic-lumbar vertebrae. 2. By the condition of things met with in reptiles, and birds (in which Gadow shows distinctly the tendency of the limb to shift backwards), and 3. By the cases met with of congenital scoliosis, in man and animals.

Conclusions.—1. That the segmental spinal nerves which enter and supply the limbs afford the most trustworthy guide to an estimation of the position of the limbs. 2. That from the evidence afforded by the nerves the position of the limbs is not constant. 3. That the position of the mammalian fore limb varies very slightly, but that it shows a tendency to shift backwards towards the hinder end of the body, from the point where it is developed. This conclusion is supported by Fürbringer's researches in birds. 4. That in mammals with an abnormal number of cer-

vical vertebrae, the irregularity is to be explained, not by the omission or interpolation of vertebrae, but by a shifting of the limb, and a correlated difference in the development of associated parts. In the manatee, for example, the presence of six cervical vertebrae is explained by the condition of the brachial plexus, which shows that either the fore limb is developed in this case further forwards in the neck; or it represents an archaic condition. 5. That the position of the hind limb is less constant than that of the fore limb. It may remain opposite the segments with which it is embryonically connected: but in mammals it displays in most cases a tendency to move backwards, like the fore limb. This conclusion is strengthened by the work of Gegenbaur, Gadow, and Mivart, in birds and reptiles. 6. That in consequence of this process of shifting, other correlated and concomitant changes occur in associated parts. The “sacral” vertebrae, therefore, do not necessarily, from a developmental point of view, correspond to segments concerned in the origin and growth of the limb. They are merely those bones with which the ossa innominata are articulated, and may not be strictly homologous with the corresponding bones in another individual or species. They simply serve a similar purpose in supporting the limb girdle. 7. That in certain exceptional cases, as in man, there is a tendency for the limb girdle to shift forwards in relation to the axial skeleton, along with a concomitant shortening of the vertebral column.

ON CONGENITAL DIAPHRAGMATIC HERNIA.¹

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Introduction.—Cases of diaphragmatic hernia, arising from whatever cause, are rare enough to make them objects of interest to both the anatomist and the surgeon. They are so seldom met with in practice, indeed, that our standard works on surgery either dismiss them with scant notice, or omit all mention of them. The best systematic account of the condition which I have been able to meet with is that by André Boursier.²

The forms of diaphragmatic hernia are three—traumatic, acquired (or spontaneous), and congenital. The traumatic variety, caused by wounds or lacerations, is generally fatal, either immediately from strangulation, or subsequently from inflammation of one of the serous membranes. The acquired or spontaneous form is due to the same causes as give rise to other ruptures, and may produce no symptoms, as it very frequently interferes in no way with the vital functions. The congenital form is without doubt the most interesting to the anatomist, chiefly on account of the light it throws on the mode of development of the diaphragm—a subject which, in spite of our recent advances in embryology, yet presents much difficulty.

These ruptures may be classified in diverse ways, according to the amount of interference with the vital functions to which they give rise; according to their position; or according to the mode in which the opening of the hernial sac is formed. Adopting the last-named classification, we find there are three principal varieties met with:

1. Due to defective formation of the diaphragm.
2. Occurring through one of the natural openings.
3. Due to distension of the fibres of the diaphragm.

1. **Defective formation of the Diaphragm.**—*a.* Total absence of the diaphragm is extremely rare. Cases are recorded by Meckel,³ Bowditch,⁴ Duguet,⁵ and Diemerbroeck.⁶ The last case must be regarded with suspicion, as it is stated to have occurred in a boy, aged 7. *b.* Partial absence of the diaphragm is the most frequent cause of congenital hernia. The rupture is generally placed laterally, and is on one side only. A few cases are recorded in which it occurred on both sides (Bowditch,⁷ Willigh,⁸ etc.) Duguet⁹ denies that a congenital hernia can be placed mesially; one case, at least,¹⁰ points rather towards the fact that this asser-

¹ Read in the Section of Anatomy and Physiology, at the Annual Meeting of the British Medical Association, held in Glasgow, August, 1888.

² *Dict. Encyclop. des Sci. Méd.*, Tome xxix, Art. Diaphragme.

³ Meckel, *Anat.*, vol. iv.

⁴ Treatise on Diaphragm. Hernia, *Charleston Med. Journ. and Review*, May, 1855.

⁵ *De la Hernie Diaphragm. Congénitale*, Paris, 1866.

⁶ Diemerbroeck, quoted by Boursier, *loc. cit.*

⁷ *Loc. cit.*

⁸ Willigh, *Journal Trimestriel de Prague*, 1856.

⁹ *Loc. cit.*

¹⁰ Bednar, Vienna, 1852.

¹ Read in the Section of Anatomy and Physiology, at the Annual Meeting of the British Medical Association, held in Glasgow, August, 1888.