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THE
ATTITUDE AND POSITIONS,
NATURAL AND PRETERNATURAL,
OF THE
FŒTUS IN UTERO,
ACTS OF THE REFLEX OR EXCITO-MOTORY SYSTEM.

BY
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ATTITUDE AND POSITIONS

NATURAL AND ARTIFICIAL

POSTURE IN UTERO

OF THE FETUS IN THE UTERUS

[FROM THE MONTHLY JOURNAL OF MEDICAL SCIENCE.]

BY J. H. HARRISON, M.D.

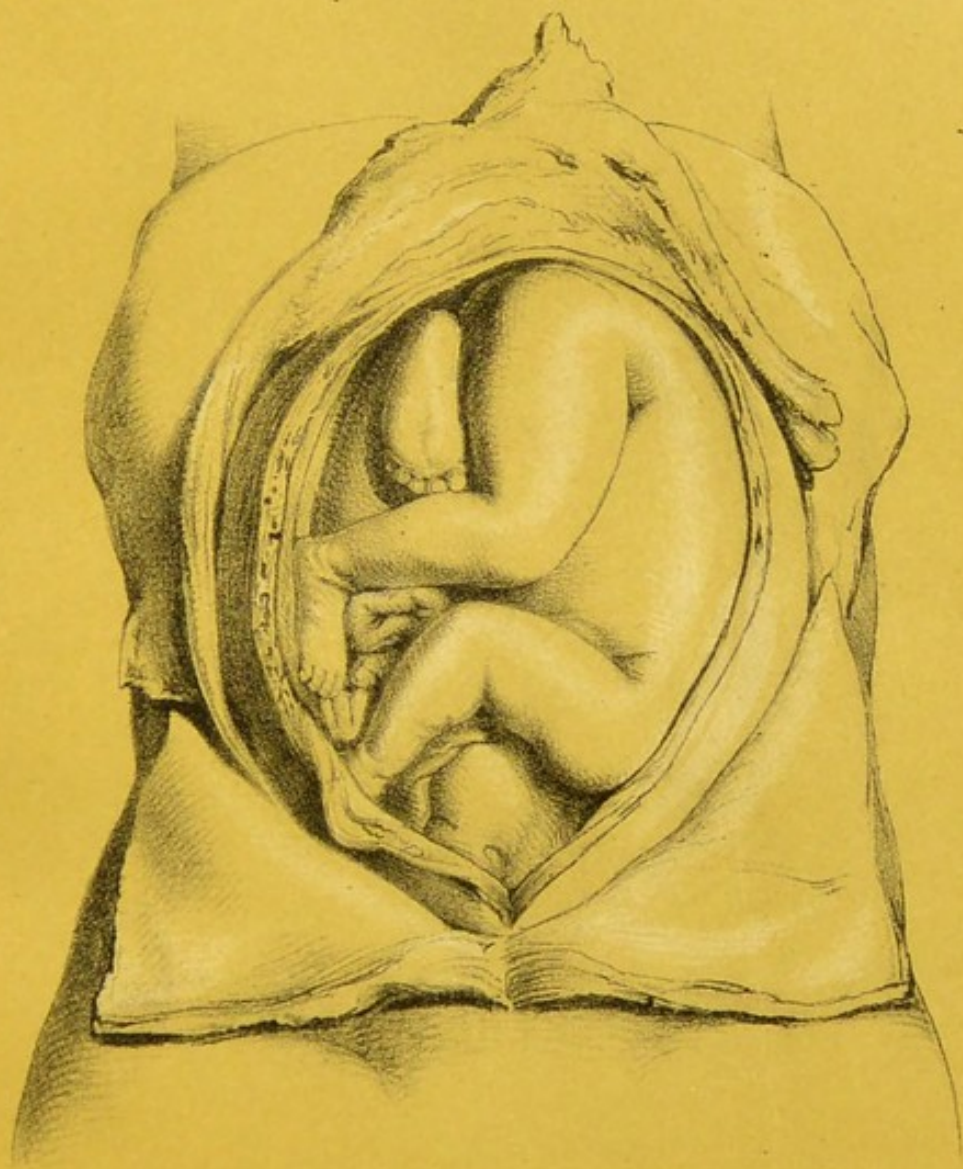
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Plate I.



Attitude of the Foetus
near the full term of utero-gestation.



ON THE
ATTITUDE AND POSITIONS
OF THE
FÆTUS IN UTERO.

PART I.

IN numerous important points, the physiology of the human fœtus varies from the physiology of the human adult. The mechanism of some of the highest functions in the economy is different in the one from what it is in the other. The mode, for instance, in which nutrition is effected in the infant before it leaves the uterus, differs greatly from the mode in which nutrition is conducted in the individual after birth. The means by which respiration is accomplished during intra-uterine life, are very different from the means by which it is accomplished during extra-uterine life. The mechanism and course of the circulation is not the same in these two states of existence. After birth the circulation is double (systemic and pulmonic); before birth it is carried on as a single circulation, in an apparatus intended afterwards, and ultimately, to serve for a double circulation. The common attitude and position of the fœtus and adult are equally different. The adult in his waking state, and whether walking or standing, carries the body vertically, with the head uppermost. The fœtus in utero, for some time before birth, usually also carries the body vertically, but with the head placed undermost. The position of the head in relation to the body differs in the two states of being—in the adult it is placed higher than the body, in the fœtus it is placed lower than the body.

At, and for some time before the full period of utero-gestation, the mode in which the child is situated in utero is generally as fol-

lows:¹—The trunk and spine are usually slightly curved, and the head is bent forwards, with the chin approaching toward the sternum. The thighs are drawn upwards and flexed upon the abdomen; and the legs are flexed and laid along the posterior surfaces of the thighs. The feet, which are sometimes crossed, are thus placed near the nates, and in front of them. In the interspace between the knees and face the upper extremities are situated, the arms being laid across the sides of the thorax, and the forearms flexed and crossed in front of the chest.² The whole foetus is thus flexed and rolled up into an *ovoid mass*, of such a form as to occupy the least possible space. One end of the ovoid is formed by the head, the other by the breech of the child.³

This ovoid is, in obstetric practice, found to be placed over, or to present at, the os uteri at the time of labour, in three different modes. 1. In a large majority of cases, the head or cephalic end of this ovoid mass is placed lowest in the uterus, and consequently presents at the time of birth. 2. Sometimes, however, the nates or pelvic extremity of the foetal ovoid is the lowest and presenting part. 3. Still more rarely the foetus is placed with its long axis lying transversely to the long axis of the uterus, and the presenting part is the side of the ovoid mass of the foetus; or, more strictly speaking, one of the shoulders or arms.

The following table shows the proportion in which these three leading genera of positions or presentations of the foetus at the full time of pregnancy, occurred in four large reports of cases furnished by Lachapelle, Boivin, Clarke, and Collins.

¹ Through the kindness of Professor Goodsir, I am enabled to give, in Plate I., a sketch of the attitude of the foetus in a subject brought into the dissecting rooms during the present winter. She had died of cholera, near the full time of utero-gestation. The placenta is seen situated on the right side of the uterus, opposite the right foot of the infant. In injecting the vessels, some wax escaped in the interspace between the two feet, and probably slightly altered their position.

² "The most common situation of the extremities is not to be determined, as they are found to be a little different in different dissections; and in the living body they vary almost every moment: thence the hands are seen indiscriminately on the head or face, or across one another, or around the knees or legs, or the legs are sometimes extended, and the feet are placed by the face, or one in that position, and the other contracted and the foot downwards."—*Dr William Hunter's Anatomical Description of the Gravid Uterus*. P. 62.

³ "The foetus in utero," says Hunter, "is naturally contracted into an oval form, adapted to the figure and circumstances of its habitation. The vertex of the head makes one end of the oval, and the nates the other. One side or edge of the oval is formed by the occiput, the back part of the neck, and the incurvated trunk; the other is made by the forehead, and the mass of contracted and conglomerated limbs. The chin is close to the breast, the trunk is bent forwards, the knees are close to the fore parts of the hypochondria, the legs drawn to the back parts of the thighs; the feet, or lower parts of the legs, decussating each other; and the upper extremities contracted into the vacant space betwixt the forehead and knees."—*An Anatomical Description of the Human Gravid Uterus*. 1794. P. 62.

Table of the Relative Number of Cases in which the Presentation of the Child was found Cephalic, Pelvic, and Transverse.

Reporter.	Total No. of Cases.	No. of Head Presentations.	No. of Pelvic Presentations.	No. of Transverse Presentations.
Lachapelle,	37,126	35,550	1390	186
Boivin,	20,517	19,810	611	96
Clarke,	10,387	10,094	245	48
Collins,	16,654	16,102	504	48
Total,	84,684	81,556	2750	378
Proportions,		96 in 100	1 in 31	1 in 224

The preceding table shows the immense proportion of cases in which the head of the child is placed over the os uteri, and presents at the full term of pregnancy. In the above table, head presentations are in frequency, in proportion to all other presentations, as 26 to 1. The presentation of the pelvic extremity of the ovoid of the foetus, is to that of the cephalic extremity as 1 to 32. The presentation of the pelvic extremity, and its frequency in comparison to that of the head, is as 1 to 32 according to Desormeaux; as 1 to 33 according to Oslander; as 1 to 34 according to Carus; as 1 to 35 according to Meckel.¹ The transverse position of the foetus, with its long axis across, or at right angles to the long axis of the uterus, is by far the rarest of the three forms of presentation. In the preceding table of cases, it occurred only once in every 224 labours. Rigby² estimates it as occurring in about 1 in every 230 cases; Churchill³ estimates it as occurring in 1 out of every 261 labours.

Various opinions, and modifications of opinion, have been suggested in order to explain why the head of the infant is thus, before birth, usually placed lowest and over the os uteri, and why some special circumstances should occasionally change this law, and produce malpositions. None of the doctrines hitherto proposed seem to have at all proved satisfactory. Indeed, so much so is this the case, that latterly some authors have looked upon any successful inquiry into the causation of the attitude of the foetus in utero, as a matter beyond the legitimate limits of physiological investigation. Thus, M. Virey⁴ has strongly argued that we ought to content ourselves with considering the fact of the position of the head of the foetus opposite the os uteri, simply as an ultimate law in animal physiology, and a law quite general to the whole animal kingdom.

¹ See Adelon's *Physiologie*, tom. iv. p. 160, and Burdach's *Physiologie*, tom. iv. p. 224.

² *System of Midwifery*, p. 167.

³ *Theory and Practice of Midwifery* p. 356.

⁴ *Mémoire sur une loi de l'économie animale relative à la position des embryons et des foetus dans l'utérus.*—*Revue Médicale*, July 1833.

The law is perhaps not so general as M. Virey¹ supposes. But granting that it were even universal, still this admission could form no kind of logical reason against the propriety of investigating how in man, or in any other species, the effect in question is accomplished, and what mechanism is employed by nature for its production. At all events, if such an investigation be improper, then almost all our other physiological investigations are equally so. Every animal, from the lowest zoophyte up to man, respire, is nourished, and is propagated by generation. In other words, respiration, nutrition, and reproduction, are all of them ultimate and general laws in the animal kingdom; but their being so surely furnishes no reason for discarding all physiological inquiry regarding them, and would not entitle us to argue, as M. Virey does, that it is hence hopeless and improper to attempt to trace, for example, regarding reproduction or respiration, the variety of means and mechanism by which these ultimate laws are brought about and accomplished in man, or in the different series and classes of the animal kingdom.

At the present time, two opinions are principally or alone held by physiologists and obstetricians with regard to the mode of causation of the attitude of the fœtus in utero with the head lowest. It is regarded by some as a result of the mere physical gravitation of the head. Others look upon it as a result of the action of vital or mental influences of an instinctive and voluntary character. In the sequel I shall first speak of these two opinions, and of the objections to which they are open. Afterwards, I shall endeavour to show that the natural attitude of the human fœtus before birth, is the result of excito-motory movements on its part. I shall then consider the circumstances which lead to preternatural positions of the fœtus, with a view of demonstrating that they are not only explicable by, but at the same time illustrative of, this new doctrine of the causation of the attitude of the fœtus. And lastly, I may take an opportunity of offering some brief practical inferences and remarks.

SECTION I.—GRAVITATION OF THE HEAD AS THE CAUSE OF THE ATTITUDE OF THE FŒTUS.

The head is, proportionably to the body, far larger and heavier in the fœtus than in the adult.² Most authorities have supposed that the position of the fœtus in utero, with the head undermost, was

¹ I have more than once had an opportunity of dissecting the female of the common blue shark, (*Squalus cæruleus*), sometimes caught by the fishermen on our coasts here. The animal is viviparous; and in the distended uterus or oviduct, I found the enclosed fœtus placed in nearly equal frequency with the head and tail directed towards the uterine opening.

² The encephalon of a new born child, according to Tiedemann, is so large as to be, relatively to the size of the body, as 1 to 6; in a full grown man it is as about 1 to 40.—*London Philosophical Transactions*, vol. xxvi., p. 503.

owing to the greater specific gravity of the head determining this part, in the erect position of the mother's body, to fall to the lowest part of the uterine cavity, or toward the os uteri.

The *period* of utero-gestation at which the preponderating gravity of the head is supposed to make it the lowest part of the fœtus, has been differently stated by different authors. Some, as Baudelocque,¹ Termanini,² Capuron,³ Meigs,⁴ and others,⁵ maintain that, from the earliest periods of pregnancy, this is the common and natural attitude of the fœtus. Others uphold, as Mauriceau,⁶ Rœderer,⁷

¹ System of Midwifery—Heath's Translation, vol. i. p. 260.

² "During the first six months of pregnancy," says Termanini, "it is certain that the fœtus enjoys so much mobility, that its position cannot but be determined by the respective weights of its constituent parts. The head of the fœtus is, in fact, the heaviest part relatively to all the others after the second month, and it results from this, that it tends constantly to direct itself inferiorly towards the orifice of the uterus."—*Archives Générales de Médecine*, vol. vi. p. 288.

³ Journal Universel et Hébdomadaire, tom. x. p. 437.

⁴ "The natural presentation is that of the head, which is turned towards the os uteri from the earliest period of pregnancy. The navel-string is nearer to the pelvis than to the head of the child, the head therefore hangs downwards; but when the cord, by the growth of the ovum, has become of a very considerable length, the child ceases to be dependent from it, for the cord is not unfrequently from twenty to thirty inches long."—*Meigs, Philadelphia Practice of Midwifery*, p. 229.

⁵ See Onymos, *Dissertatio de Naturali Fœtus in Utero Materno situ*; in Schlegel's *Sylloge ad Artem Obstetricam*, vol. i. p. 525; Gehler, *De Situ Fœtus in Utero*; in *Ibid.* p. 537.

"It is not," says Burdach, "as has been hitherto believed, towards the last period alone of intra-uterine life, and by a sort of culbute, but from the second month of this same life that the human embryo brings its head towards the inferior part of the uterus, or near its orifice. This phenomenon is the mechanical result of the erect position of the mother, since the umbilical cord is inserted at the inferior extremity of the trunk, and the upper half of the body, being the heavier, finds itself hanging."—*Traité de Physiologie*, vol. iv. p. 5.

"All the observations," says Hunter, "that I have been able to make in dissections, and in the practice of midwifery, would persuade me that the child's head is naturally downwards, through all the later months of utero-gestation; and that neither reason nor instinct teaches it, at any particular time, any trick of a tumbler or rope-dancer."—*Dr William Hunter's Anatomical Description of the Human Gravid Uterus*, p. 64.

⁶ "The spine of the child's back is placed towards the mother's; the head uppermost, and the feet downwards. It keeps usually this posture till the seventh or eighth month, at which, the head being grown very big, is carried downwards by its weight towards the inward orifice of the womb, tumbling, as it were, over its head, so that then the feet are uppermost, and the face towards the mother's great gut."—*Mauriceau, Maladies des Femmes Grosses, Chamberlen's Translation*, p. 147.

⁷ "I conclude," says Rœderer, "1. That the head of the embryo, which is extremely slender, and supported upon the chest, occupies the top of the uterus after conception; that it inclines towards the abdomen; and that the face is turned towards this part. 2. That it remains in this situation when some obstacle prevents it from descending; for example, a too small quantity of liquor amnii. 3. That it descends gradually according as it becomes heavier. 4. That

Levret,¹ Lamotte,² and others,³ that the position with the head downward, and directed to the os uteri, is only taken towards the latter months; and that it is assumed either gradually, or at last by a sudden movement and toppling on the part of the fœtus (the movement of *culbute* of the older authors). Sir Fielding Ould⁴ and Burton⁵ supposed that this downward movement of the fœtal head did not occur till the commencement of labour.

Whatever explanation may be given of the position of the infant in utero, one fact has been sufficiently established in regard to it by modern investigations; namely, that the position with the head lowest is not assumed till the latter months of utero-gestation. Before the beginning of the sixth or seventh month, the ovoid mass of the fœtus lies in utero, in nearly an equal number of cases, with its cephalic and its pelvic extremities lowest, or over the os uteri; and in a considerable proportion of instances it is still placed across or transversely, so that the trunk is opposite the os uteri. Hence in abortions, presentations of the feet or pelvis are nearly as frequent as presentations of the head; and presentations of the arm

at last, having become very large, it is carried downwards by its own proper weight. 5. Several causes may, however, prevent its descending, or derange its direction. I place in this class defect of the liquor amnii, obliquity of the uterus, tumours in the uterus, premature efforts, and external violence."—*L'Art des Accouchemens*, p. 41.

¹ "The fœtus, after the fourth month of pregnancy, has the head above, the breech below, the belly in front; but when it approaches the period of its birth, it is the back which is in front, the head below, and the breech above. This observation proves that the infant, at the later periods of pregnancy, brings down its head to where its breech was before, and that it does so by bending forwards, whether gradually or all at once, and this is what the ancients have called the *culbute*."—*Levret, L'Art des Accouchemens*, p. 74.

² "All authors," says Lamotte, "agree that the child in the uterus has its back towards that of the mother, the heels backwards, the hands upon the knees, with the head resting on them till the seventh month; that at this time the head, growing heavier by the increase of its bulk, draws the body down, making it topple, and that then the head is below and the feet above, the face towards the mother's back; as to any thing else, remaining in the same posture it was in before, which is the situation in which it remains to the ninth month, and in which it comes into the world."—*Lamotte, Treatise of Midwifery, Translation*

³ See Heister's *Compendium Medicinæ*, p. 111; Manningham's *Compendium Artis Obstetricariæ*, p. 10; Haller's *Elementa Physiologiæ*, vol. viii. p. 412.

⁴ *Treatise of Midwifery*, p. 25; and Preface, p. xiv.

⁵ "We must therefore," says Burton, "assign some other cause, which according to Ould seems to be as follows, viz., that the whole spine is curved, and its head looks down, so that the fontanelle is just opposite the fore part of the mother's belly; and therefore as the first and greatest efforts for the expulsion of the child are in the bottom of the womb, which presses directly on the back of the head, as is evident from the posture of the fœtus in utero, and from the foregoing description of the womb, they must of course immediately turn the head downwards towards the vagina, and its face to the mother's back, especially as it is at this time floating in the waters. Hence it happens, that the change of the posture of the fœtus does not happen in a natural way till the first labour pains begin."—*Burton's Essay towards a New System of Midwifery*, p. 100.

are by no means uncommon. In the Maternity Hospital of Paris, Professor Paul Dubois found, that out of 121 fœtuses, born alive or dead before the end of the sixth month, 65 presented by the head; 51 by the pelvis; and 5 were cross-births, or presented by the arm or shoulder. Further, the position of the head towards the os uteri, appears to be taken up more and more frequently and certainly from the end of the sixth month onwards. Out of 73 instances in which the child was born prematurely but alive, during the currency of the seventh month, Dubois found it presenting by the head in 61 cases, by the pelvis in 10 cases, and by the shoulder in 2 cases. Hence, while before the end of the sixth month the proportion of head presentations amounted to 55 in the 100, during the course of the next month, they were found already amounting to 82 in the 100; at the full time they amount, as we have previously stated, to 96 or 97 in the 100.

But at whatever period of the pregnancy the attitude of the fœtus is supposed to be taken, the whole idea of its head being placed lowest and opposite the os uteri, by physical gravitation merely, is a doctrine to the adoption of which there are the following insurmountable objections.

1. The doctrine presupposes that the mother's body is in the vertical or upright position, in order that the gravitation of the fœtal head may have the effect attributed to it. But during her hours of sleep and rest her body is placed horizontally and not vertically, and ought to afford many more chances than the statistical results show, of the head falling by mere gravitation into other positions and localities, than its usual and normal locality in the cavity of the cervix uteri. Besides, most practitioners have repeatedly seen patients restrained to the horizontal position for months before labour came on, without this position of the mother producing any deviation from the common position of the fœtus.

2. The doctrine further presupposes that the child is suspended in the uterine cavity by the umbilical cord.¹ But this is not in ac-

¹ "The fœtus," says Capuron, "is generally suspended from the uterus by the umbilical cord, and represents a kind of lever or hydrostatic balance with two arms immersed in the liquor amnii. These two arms commence at the umbilicus, and terminate the one at the apex of the head, the other at the heels or feet of the fœtus. * * * The head, which is placed at the extremity of the super-umbilical arm of the balance, must obey the gravitation which forces it down to the neck of the uterus."—*Mémoire sur la Situation du Fœtus pendant la Grossesse*;—*Journal Universel et Hebdomadaire*, &c., tom. x. p. 437. "The reason," says Hunter, "why the child's head is commonly downwards may be supposed to be this: the child is specifically heavier than the liquor amnii, and therefore, in the various attitudes of the mother, is always in contact with and supported upon the depending part of the uterus. This, in the more common attitudes, is the cervix uteri. The child's head and upper part of the trunk contain more matter, in proportion to their surface, than the lower part of the body; thence the head will more generally fall down to the

cordance with fact, at least it does certainly not hold good at that advanced period of pregnancy when, as we have just stated, the child no doubt assumes the position with the head downward, viz., in the latter months. In order to suspend the foetus by the cord, the placenta, from which the cord springs, would, in the upright position of the mother's body, require to be fixed at the fundus uteri. The placenta, however, is almost always implanted on one side of the uterus,¹ rarely at the fundus. Further, in order to suspend the foetus, the cord itself, as the medium of suspension, would require to be at least considerably shorter than the length of the uterine cavity, in which it is supposed to perform this function of suspension. But it is far too long to effect such a purpose. It is in general from eighteen to twenty inches, while the whole depth of the pregnant uterus is not above twelve or fourteen inches. The physical conditions, in short, necessary for the supposed physical suspension of the foetus by the cord, assuredly do not exist in the latter periods of pregnancy, when the foetal head first comes to assume the position downwards.

3. When physical conditions exist the very opposite of those that have been supposed necessary to effect the suspension of the foetus by the umbilical cord, these conditions do not make any corresponding deviation in the position of the child. When the cord is twisted and fixed around the neck of the infant, it makes the lower half of the foetus, from the neck downwards, by far the longest and heaviest end of the supposed balance, and hence ought, according to the doctrine of gravitation, to make, in these circumstances, the pelvic instead of the cephalic end of the child the presenting part. Here, however, fact does not accord with theory. In about one in every seven cases, according to Dr Churchill² (in 174 cases out of 1271 labours), the cord is found coiled around the child's neck or limbs, and yet without the usual position of the head being altered by it. Out of 1417 labours among the patients of the Edinburgh Maternity Hospital,³ the cord was twisted around the child's neck once, twice, or oftener, in 164 instances, or in one in every eight cases; and in seven other instances, it was coiled both around the neck and limbs; but without changing in any of the cases the position of the infant from its normal direction with the head downwards.

4. If the physical gravitation of the head of the child were the cause of the normal position with the head lowest, then this position ought to be found with more frequency and certainty when

lower part of the uterus."—*Anatomical Description of the Human Gravid Uterus*, p. 66.

¹ See Naegele on Auscultation, Translation of Dr West, p. 79; Velpeau's *Traité d'Accouchemens*, vol. i. p. 297.

² *Researches on Operative Midwifery*, p. 281.

³ See *Monthly Journal* for November 1848.

the gravitation of the head from any cause was rendered proportionally greater than natural; with less frequency and certainty, when from other causes the gravitation of the cephalic extremity of the infant was rendered proportionately less than natural. The very contrary, however, of all this is the truth. In cases of intra-uterine hydrocephalus, the child's head is larger and heavier than usual; and sometimes it is so to an excessive degree. But this condition of the head, this increased preponderance and gravitation of it, does not render head presentations in these cases more common than usual, but the very reverse. In an excellent thesis on hydrocephalus of the fœtus as a cause of rupture of the uterus—my young friend, Dr Thomas Keith, last year collected the histories of 69 cases of intra-uterine hydrocephalus at birth. Of these 69 hydrocephalic fœtuses, 11 presented preternaturally, or 1 in 6. When the head and fœtus is normal, preternatural presentations occur, in proportion to other presentations, as 1 to 26. Hence, preternatural presentation was four times more frequent in hydrocephalic than in natural cases; while it ought to be more frequent in the former than in the latter, if the doctrine of gravitation were true. Again, anencephalic fœtuses, with the whole brain and arch of the cranium wanting, are still often found presenting naturally. I have been present at the birth of three anencephali that had reached the full term of pregnancy. All of the three presented with the deformed and diminished cephalic extremity over the os uteri.

5. When a human fœtus of the latter months is placed experimentally in fluid, in descending through the fluid the head does not turn and fall first to the bottom of the containing vessel, as the theory of gravitation takes for granted that it would. Thus, if a dead new-born fœtus be plunged into water, contained either in a vessel shaped like the uterus, or in a large bath, the part which gravitates, and strikes the bottom of the vessel or bath first, is the back or scapula, and not the head. M. Dubois first pointed out this fact as the result of numerous experiments which he had made on fœtuses from the fourth to the ninth month; and in several instances in which I have repeated the experiment, I have found the same result.

6. When the child dies in utero, it still continues to be subjected to the same physical laws as when it is alive. The mere death of the fœtus does not in any way remove it from the agency of gravitation. When all its vital actions have ceased, the body should in fact be more subject than heretofore to all influences, such as gravitation, which are merely physical in their character. The dead infant ought therefore, as frequently as the living, to have its head placed as the presenting part over the os uteri, provided the mere physical gravitation of the head were the reason and cause of

that position. Experience, however, amply proves that this is not the fact. In other words, experience proves that malpositions of the child, or the presence of other parts than the head at the cervix and os uteri, is in the latter months a far more frequent occurrence when the child is dead, than when it is still alive.

During the seven years that Dr Collins had charge of the Dublin Lying-in Hospital, 16,654 children were born within the house. Of these 16,654 children, 15,533 were born alive, and 1,121 dead. Of the 1,121 dead children, many no doubt died during labour; but 527 of them were in a putrid state, and consequently may be correctly regarded as having perished in utero, and before labour commenced. Among the 15,533 children born alive, 278 presented preternaturally, or 1 in 57; 250 presented by the pelvic extremity, or 1 in 62; 28 presented by the upper extremity, or 1 in 555; 15,255 presented by the head, or 98 in 100. On the other hand, among the 527 children born putrid, as many as 94 presented preternaturally, or 1 in 5; 88 presented by the pelvic extremity, or 1 in 6; 6 presented by the upper extremity, or 1 in 88; 433 presented by the head, or 83 in 100. This contrast between the proportions of preternatural and natural positions among the living and dead children, may be expressed in a tabular form as follows:—

Relative Proportion of Natural and Preternatural Presentations among Living and Putrid Children.

Presentation.	With 15,533 Living Children.	With 527 Putrid Children.
Cephalic Presentations . . .	15,255, or 98 in 100	433 or 83 in 100
Pelvic Presentations . . .	250, or 1 in 62	88 or 1 in 6
Transverse Presentations . .	28, or 1 in 555	6 or 1 in 88

7. The position of the foetus in utero, with the head lowest, is a vital action, and dependent upon the existence and continuance of life in the infant; and consequently it is not simply a mechanical result, and dependent upon the mere preponderating weight of the head of the child. The last paragraph (6.), proves that the position of the head at the os uteri, is by no means so frequent when the foetus is dead, as when it is alive; that, in other words, its *vitality* is in some way or another connected with the existence of this particular position, with the head undermost and over the os uteri. One objection may be urged against this deduction, as derived from the preceding data regarding putrid children, viz., that as "putrid" foetuses are often born prematurely, the frequency of their malposition may depend upon the prematurity of their birth, and not upon the fact of their death. In some of the data drawn from the Maternity Hospital of Paris, and published by Professor Dubois, there is an answer to this objection. I have already stated, that out of 73 children born prematurely, but alive, during the currency of the

seventh month of pregnancy, Dubois found that 83 per cent., or 61 in the 73 cases, were head presentations; the pelvic extremity presented in 10 instances out of the 73, or in one case in 7; and the shoulder presented in 2 instances. These children were, I repeat, born *alive*. But when the children born during the course of the same seventh month of utero-gestation were already *dead*, the results were very different. Out of 46 children thus born prematurely, but dead, during the currency of the seventh month, 45 per cent. only, or 21 in the 46 cases were head presentations; the pelvic extremity presented in 21 instances out of the 46, or in about 1 case in 2; and the shoulder presented in 4 instances. The following arrangement expresses these curious facts in a tabular form:—

Table of the Relative Presentations among Children born prematurely during the Seventh Month, as affected by the Life or Death of the Child.

State of Child.	Total Cases.	Shoulder.	Pelvis.	Head.	Proportion of Head Cases.
Alive .	73	2	10	61	83 in 100
Dead .	46	4	21	21	46 in 100

The data which I already adduced in a preceding page, prove that the fœtus does not take any very determinate position till nearly the commencement of the seventh month; and that during the course of the seventh month, the position with the head downwards begins to be assumed with considerable frequency and certainty. The data in the present table further prove, that the position with the head downwards is lost, or not taken, provided the infant be dead. Or, in other words, the table shows what I have stated at the commencement of the present paragraph, that the assumption and maintenance of the position of the fœtus with the head undermost, and over the os uteri, is dependent upon the existence and continuance of *life* in the child, and consequently is not a physical, but a *vital* action.

The next question, therefore, which meets us is this,—What is the nature and character of the *vital* action by which the fœtus obtains and keeps up its position in utero with the head lowest? The assumption and maintenance of any position of the body, if dependent not upon physical but upon vital causes, can result from no other known vital action than a muscular action. Human physiology presents us with no other known action or power whatever, except muscular action, that can produce motions capable of altering or regulating the position either of the whole body or of any of its parts. And the real question, therefore, resolves itself into this—What is the nature and character of the *muscular* action by which the fœtus assumes and maintains its position in utero with the head lowest?

SECTION II.—INSTINCTIVE AND VOLUNTARY MUSCULAR ACTIONS AS THE CAUSE OF THE ATTITUDE OF THE FŒTUS.

Some physiologists, as Cabanis, Ennemoser,¹ &c., have upheld that the unborn fœtus is already endowed with physical powers, and performs acts referrible only to the existence and exercise of mind. They maintain that metaphysicians have as yet one department of their science to investigate, viz., the state and degree of development of psychical life in the intra-uterine fœtus. Cabanis² holds that the unborn infant already possesses the consciousness of its own existence with the first traces of fundamental ideas, and has already wants and desires, and both the will and the power of exciting volitional muscular movements.

Long ago, Ambrose Paré,³ and Chamberlen,⁴ attributed the position of the head of the infant at the os uteri in labour to a psychical rather than a physical cause. But the author who has principally maintained and developed the idea, that the position of the child is a psychical result, is Professor Paul Dubois of Paris.

In 1832 this distinguished obstetrician communicated to the Academy of Medicine of Paris, an elegant and remarkable essay on the subject. M. Dubois' essay is published in the second volume of the Academy's memoirs, under the title of "*Memoire sur la cause des Présentations de la Tête pendant l'accouchement et sur les déterminations instinctives ou volontaires du fœtus humain.*"

After showing, by some of the arguments that I have stated in the preceding section, that the position of the fœtus, with the head lowest and over the os uteri, is certainly not the result of gravitation, M. Dubois, by a kind of reasoning by exclusion, comes to the conclusion, that the position in question must be the result of

¹ Historich-physiologische Untersuchungen ueber den Ursprung und das Wesen der menschlichen seele. Bonn 1824.

² Rapports du Physique et du Moral de l'Homme, tom. ii. p. 431.

³ After speaking of the infant, at the full term of pregnancy, requiring more food than it can now obtain through the vessels of the cord, Paré describes it as endeavouring violently to escape from the uterus to supply its wants, and thus, by its strong violence (*grande impetuosité*), breaking the membranes. When the womb then begins to open, "the childe (says he), pursuing the aire which hee *feeleth* to enter in at the mouth of the womb, is carried with its head downwards."—*Paré's Works*, English translation, p. 899.

⁴ Of the celebrated obstetric family of the Chamberlens—the inventors of the forceps—we have few or no literary remains. Hugh Chamberlen, one of the sons, translated the work of Mauriceau, and has added a few sparse notes of his own. To the passage which I have already quoted in a preceding page from Mauriceau, regarding his belief in the preponderating weight of the head of the fœtus being the cause of its common position, Chamberlen affixes as an annotation, that the foetal head comes lowest, and to the os "rather by a natural *propensity* than any weight of the head."—*Translation of Mauriceau on Diseases of Women with Child*, &c., p. 147.

instinctive and voluntary determinations on the part of the fœtus, for he confesses himself unable to conceive any other influence by which it could be effected.¹

The terms, however, used by M. Dubois, "instinctive and voluntary," are so much of a conventional character, and are liable to have such different significations attached to them by different writers and readers, that it is necessary for us to understand the meaning which M. Dubois himself affixes to them, in order that we may justly appreciate his views and reasoning on the subject. M. Dubois enables us to do this by an illustrative explanation, which he himself gives of the terms, in a note appended to his essay, while, at the same time, he confesses how difficult it is, in relation to some notions and actions, to separate and limit the effects of instinct from the effects of volition and individual mental intelligence.

A bird builds a nest. The building of the nest is, says M. Dubois, an instinctive act, and the object of an irresistible impulse; as well as are the form or general plan and materials of its construction in each particular species. But, in his opinion, the means by which this instinctive determination is attained, such as the choice of an expedient place, and the search for, seizure, and carriage of the materials appropriate for the edifice, so far involve and imply, in different shades, acts of individual mental activity and volition—"voluntary determinations"—on the part of the bird.

By the word "instinctive," therefore, as applied to the attitude of the fœtus, M. Dubois implies the fact, that the situation of the head over the os uteri, is an act performed by the infant, independently of all experience and all imitation; and with the object and view of placing its head in the position which is most favourable for its safety and protection during labour. The word, in short, signifies that the *final cause* of the position is one of wisdom and foresight; and every person will, I believe, readily grant this part of the proposition. Any other position would endanger far more greatly the safety of the child, and consequently the whole object of the function of reproduction, viz., the continuance of the life of the species. The principal peril which the fœtus undergoes during labour, is the

¹ "M. Dubois," says Dr Ramsbotham, "has ascribed the general situation to an instinctive impulse implanted in the fœtus, which inclines it to take the most favourable position for its escape—as the needle points mysteriously to the pole. But such a mode of reasoning and illustration cannot be considered either as argumentative or conclusive; it is, in fact, completely evading the question, after attempting to elucidate it; and the method he has taken can only be regarded as a cloak for human ignorance. It would, in my opinion, be much better not to endeavour to explain the secrets of nature, so deeply hidden, but to content ourselves with referring this also to a general, though not invariable law—a part of the great system which shows the design, and exemplifies the harmony that reigns throughout the whole works of Providence."—*Obstetric Medicine and Surgery*, p. 309.

danger of asphyxia from compression of the umbilical cord. In head presentations, however, the risk of this accident is immeasurably less than it is in pelvic or transverse presentations. The whole figure of the child is that of a cone,—the head forming the basis of the cone, and the feet its apex. When the head or basis of the cone presents, and dilates the passages first, then, after the birth of the head, a single pain generally expels the body, and the chances of compression of the cord come thus to be rendered exceedingly slight. But when the apex of the cone (the feet or pelvis), is placed at the os uteri, and advances first into the passages, the cord is subject to much greater chances of compression between the mother and infant; for the higher and broader end of the cone then slowly, and with gradually increasing difficulty, makes its transit through the pelvis, the cord becoming more and more liable to compression during this transit. Many more children are consequently born dead under transverse and pelvic, than under cephalic presentations.

We acknowledge then willingly in this sense, the truth of M. Dubois' expression of the position of the child being an "instinctive determination," in as far as the final cause or object of the position is concerned. But we believe that he takes an erroneous view of the subject when he adds, that the mechanism by which nature effects this instinctive determination of the head downwards to the os uteri, consists of an almost constant series of movements, produced by "intentional determinations," and "small volitions" (*petites volontés*), on the part of the fœtus. The position of the fœtus is, I believe, certainly the result of the movements which it itself performs in utero; but these movements are not of a volitional, and consequently mental origin, but simply of a reflex or excito-motory character. Before pointing out the proofs of this view, let us glance at what the intra-uterine movements of the fœtus really are; and in doing so, I shall principally follow and abridge the lucid statements of M. Dubois himself.

When we apply and press our hand over the pregnant uterus, in the latter months of pregnancy, movements of the fœtus are often produced, and these movements are simultaneously perceived by us and by the mother. Touching and irritating the foetal head through the os uteri during labour, generally leads to the same result. The pressure of the end of the stethoscope upon a projecting part of the body of the fœtus, almost always produces foetal movements. Sometimes it can be felt striking its limbs, as it were, against the instrument, or against the uterine parietes, when we have occasion to use auscultation during pregnancy or labour. "Pregnant females," says M. Dubois, "can generally make and provoke foetal movements at will; for there are few mothers who, in attempting to seize or tickle through the abdominal walls the small foetal feet which sometimes press painfully against and protrude these walls, have not felt the infant immediately draw them back, in order to take up another

position, or answer by a rapid blow to the impression which it perceives." Warm or cold bodies when swallowed, or when applied to the abdomen externally, have sometimes a marked influence upon the movements of the fœtus in the way either of increasing or suspending them.¹

"Thus," adds M. Dubois,² "not only the susceptibility and the power of locomotion are exercised during fœtal life, but even the regular and almost constant succession of impressions perceived, and of movements resulting from these impressions, indicates sufficiently that in the fœtus there is the same connexion between these two functions as exists in the adult. The fœtus in the uterine cavity has the feeling of external impressions, and these command (so to speak) the exercise of its powers of locomotion; and this faculty is found nowhere in the animal kingdom without being associated with spontaneous and intentional determinations, and consequently with internal perceptions, which ordain them."

These fœtal movements, M. Dubois further shows, are generally exerted and repeated under certain determined conditions, as, for instance, under great changes of position on the part of the mother, as when she suddenly sits up or lies down. In some mothers, particular positions on the side, back, &c., always produce them. When the mother's stomach is empty, the fœtal movements sometimes become excessive. And he adds, "When it happens accidentally, during pregnancy or labour, that the umbilical cord of the child becomes compressed, the fœtus testifies by repeated movements both the sentiment of restraint which it feels, and its wish to be relieved from it."

From these facts M. Dubois³ draws the following conclusions:—"The human fœtus, therefore, possesses the faculties of sensation and motion, and these faculties of sensation and locomotion are already related the one to the other in the same manner as they are destined to be during the whole life of the individual. In the narrow sphere of its existence, it has wants, the feeling of well-being and perhaps of pain; habits, and perhaps desires, and volitions; its

¹ In this instance—viz., the apparent fœtal movements following the impressions of cold or heat applied to the surfaces of the abdomen or stomach—the uterine walls are probably *first*, if not alone, affected through their reflex system of nerves. All the different varieties of movements mentioned in the text have been maintained by Eggert (see *Rust's Magazin*, vol. xvii. p. 62) to be movements in the uterine or abdominal walls alone, and not in the fœtus. Every physician and mother can easily prove, by their own daily experience, the unsoundness of such a view. In speaking of the fœtal movements apparently following sudden external impressions of heat and cold, M. Dubois states, that "in rural economy they take advantage of this fact to ascertain if chickens have perished in their shells before the end of incubation. With this view they plunge the suspected eggs into cold water, and immediately the movements of some show the enclosed fœtuses to be still alive; the immobility of others show that in them the chicks have perished."

² Mémoires de l'Académie Royale de Médecine, Tom. II. p. 280. ³ *Ib.* p. 284.

movements are often the decided indications of these feelings and desires, as its cries will be after its birth. Further, if any of its movements appear to us to be altogether automatic, it is only because we have not studied them so profoundly as to discover their cause or guess at their intention."

"Having demonstrated that the foetal movements have an object, sometimes fixed, sometimes only to be guessed at, and that they may, consequently, be looked upon as true instinctive determinations, we have only further to prove that it is in consequence of a determination of this sort that the head of the foetus in the mammalia is generally found situated at the pelvic end of the uterus. This point we shall demonstrate in very few words, for the proof itself results from the very facts which we have already adduced. If by some of these facts we have demonstrated that it is not by the laws of gravitation that the head of the foetus is drawn towards the uterine orifice,—if by other facts we have shown that, during intra-uterine life, some acts depend upon an instinctive or voluntary action, then it appears to us altogether impossible not to class among these last the almost constant position of the head at the os uteri; for it is only possible to choose between this cause and mere chance (*le hazard*); the choice of intelligent men in this case cannot be doubted."

These conclusions of M. Dubois are, I believe, not what the facts themselves warrant and point to. We fully admit the truth of his premises regarding the extent and variety of muscular movements performed by the foetus; we further believe, as will be subsequently shown, that these movements constitute the immediate cause and mechanism of the peculiar attitude and positions of the foetus; but we altogether dissent from the deductions which he has drawn from his data with regard to the actual physiological nature or character of these movements. They are not the result of the "spontaneous determinations" of the foetus: they do not prove, as he supposes, that "the faculties of sensation and motion are developed and exercised long before birth," already connected together, as in the adult, by intermediate mental operations, such as sensation and volition; they are not *psychical* nervous actions, but *physical* nervous actions; they are not, in short, volitional or sensorio-volitional movements, but movements entirely of a reflex or excito-motory character; movements not dependent on the cerebral system, but referable entirely to the "true spinal system."

It is well known that modern physiology and medicine stand indebted to the masterly and beautiful investigations of Dr Marshall Hall, for systematizing and elaborating our knowledge of a large and most important class of animal muscular movements, that are fundamentally altogether independent of sensation, consciousness, or volition, and consequently are not mental in their origin or working; that are connected with the spinal cord as their nervous centre or centres, and not with the brain, and may hence be performed when all influence from the brain is entirely removed;—and that originate

in impressions, made principally upon mucous and cutaneous surfaces, which impressions being conveyed from these surfaces by afferent, excitor, or incident nerves (as they are variously termed) to the spinal centre, lead thus indirectly to many and often complex muscular movements through some of the motory nerves connected with that centre becoming in consequence secondarily excited. The resulting movements are termed reflex or excito-motory, because they are induced by excitations transferred or reflected from one set of nerves to another, that is, from the excitor to the motory nerves, through an intermediate nervous centre. The movements of the fœtus in utero are of this reflex or excito-motory character. That they are so is, I think, proved by the fact, that in all important points they correspond with the most fixed characteristics of other undoubted forms and varieties of reflex or excito-motory muscular actions. The principal characteristics of true reflex movements consist,—1. In the anatomical conditions under which they are capable of being performed; 2. in the origin and character of the movements themselves; and 3. in the physiological object or objects with which they may be performed. I proceed to show briefly, that in these various particulars the movements of the fœtus in utero correspond to the proper characteristics of true reflex or excito-motory movements.

1. *The Anatomical Conditions under which the Movements may be performed.*—Dr Hall and others have shown, that true reflex or excito-motory movements persist in decapitated animals, when all influence of the brain, and consequently of sensation and volition, is necessarily removed. In instances of paraplegia in the human subject, dependent upon complete destruction and division of the spinal cord in the dorsal region, and hence when the agency of the brain was entirely cut off, reflex muscular movements sometimes remain in the muscles of the lower extremities, and are capable of being excited, sometimes violently, by slight irritations applied to the soles of the feet, &c.—the patient *seeing*, but not feeling, or being otherwise aware of the resulting movements in his own limbs.¹ That the fœtal movements are of the same character, is so far proved by the anatomical fact, that they may occur and go on during the period of intra-uterine life, and even for a day or two after birth, when, from malformation, the brain is entirely absent. The histories of cases of anencephalous monsters show that the intra-uterine movements are the same with them as with other children; and I have seen one survive for thirty-six hours after birth, performing various excito-motory movements during that time,—swallowing, crying, and moving the limbs when

¹ Cases of the same kind have been recorded by Lallemand, St Hilaire, &c., &c. See Dr Hall's Work, p. 134; or St Hilaire's *Histoire des Monstruosités*, Vol. II.

the skin was pinched or irritated.¹ These cases afford us evidence of this amount—that all the usual foetal movements are capable of being performed without a brain, and consequently without the agency of mind, and hence are not of a sensational or volitional character, but fall within the class of reflex or excitory movements.

2.—*The Origin and Character of the Movements.*—If *after* birth we irritate the sole or palm of the new-born infant (whether awake or asleep), muscular movements are excited in the limb. These are acknowledged by all physiologists to be excito-motory movements, as much so as the closure of the lips around the finger or nipple. If, *during* labour, the foot or hand present, and we irritate in the same way the protruded limb, it will excite motion in it of the same kind, as I have in several cases taken an opportunity of ascertaining. During labour, irritation of the scalp of the child with the finger, in common head presentations, is usually followed in the same way by some movement of the head. Go a step further back in the life of the infant, and apply similar irritations to the limbs or surface of the infant through the abdominal walls *before* birth, or during pregnancy, and, as we have seen, the same results are obtained; movements of a similar kind are excited, and the irritated limb is moved away. But these movements are to the feelings of the mother exactly the same in character, as those which are usually and constantly perceived by her as made by the unborn foetus within her. Their independence of the brain, and true excito-motory character, is proved by their existence in ancephalous foetuses *after* birth, as stated in the last paragraph. They originate in excitations or impressions made upon the cutaneous surfaces, as many other reflex movements do. We shall afterwards see that the almost incessant and persistent character of the movements in some foetuses during their intra-uterine life, is another evidence of their excito-motory nature. For the “true spinal system never sleeps.”

3.—*The Physiological Object of the Movements.*—The acts and physiological objects of the reflex or excito-motory system are stated by Dr Marshall Hall in the following terms:—“These acts,” says he, “are found to preside over two important classes of functions, viz., those of the *preservation of the individual*, and of the *propagation of the species*.”² It would be difficult to describe in more terse and apposite words the objects aimed at and attained by the position of the head of the foetus over the os uteri at the time of labour. The excito-motory character of the foetal movements, as leading to

¹ See the interesting cases recorded by Dr Barlow, Dr Budd, &c.; or Dr Marshall Hall's own work, *On the Diseases and Derangements of the Nervous System*, p. 234, &c.

² *New Memoir on Nervous System*. (1843). P. 51.

this position, is so far proved by the result of the movements fulfilling both the ends for which reflex motions seem specially designed.

But *how* do excito-motory or reflex motions on the part of the foetus place the head of the infant below its body, and over the os uteri? In the next sections I will attempt to answer this question, by showing by what means and mechanism these foetal reflex or excito-motory actions make the child assume and maintain the common position with the head directed downwards; or force it to place itself in malpositions or preternatural presentations under various preternatural circumstances.

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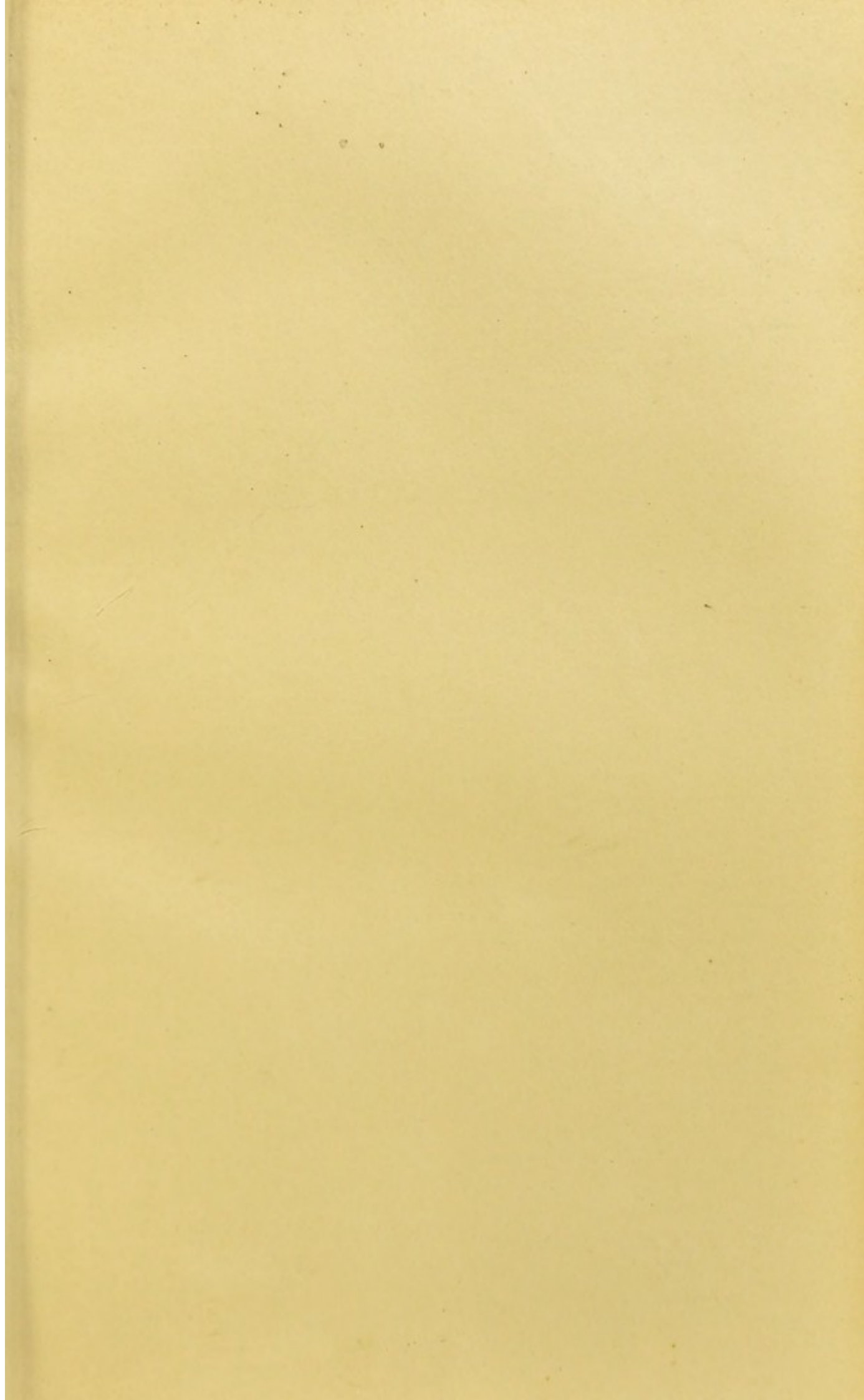


Plate II.

Fig. 1.

Ovoid form of Uterus.

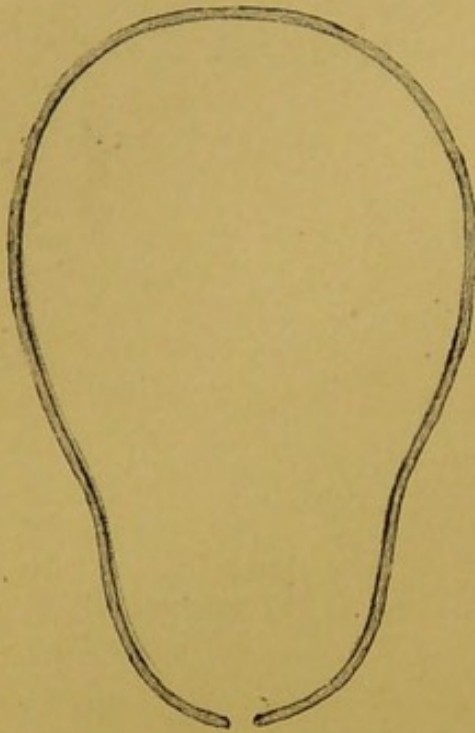


Fig. 3.

Adaptation of Foetus to Uterus.

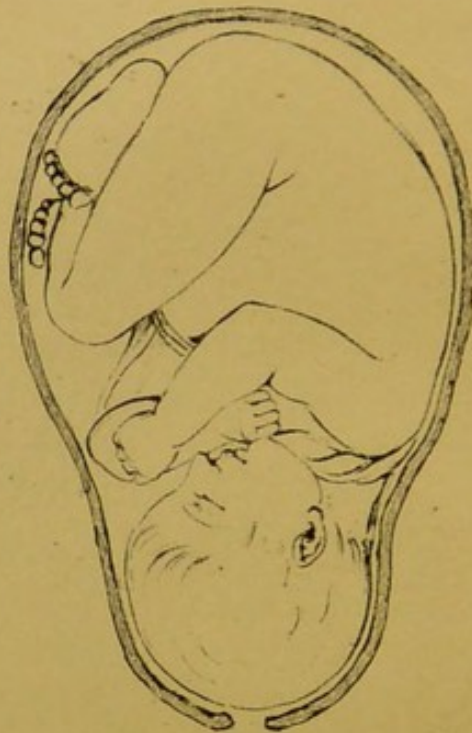


Fig. 2.



*Ovoid form of Foetus.
at full time.*

Fig. 4.



*Foetus and Uterus
at fifth month*

PART II.

SECTION III.—REFLEX OR EXCITO-MOTORY MUSCULAR MOVEMENTS THE CAUSE OF THE ATTITUDE OF THE FŒTUS.

Let us now attempt to point out the means or mechanism by which the special position of the infant in the latter months, with the head downwards, is assumed and maintained through the instrumentality of the foetal reflex or excito-motory movements. In fulfilling this object, we shall speak first of the position of the foetus at the full term of pregnancy, and the mode in which it is *maintained* by reflex action; secondly, we shall inquire how and when reflex action enables the foetus to *assume* this position; and lastly, we shall offer a few observations on the appropriate stimuli calling the reflex motions of the foetus into action, the parts of its surface most susceptible of the external impressions leading to its reflex motions, and the period of life at which reflex muscular motions are first and principally remarked.

1.—*Mode of Maintenance of the Position of the Fœtus towards the end of Pregnancy.*

At, and (as we have already seen) for some time before parturition, the human foetus is rolled up into an ovoid-formed mass, with its cephalic extremity placed lowest or over the os uteri. When thus placed, it stands, so to speak, upon its head, when the mother is in the erect posture. To comprehend the mode in which this peculiar position is maintained during the latter period of utero-gestation, it is necessary to attend to the relative shapes or forms of the uterus and of the foetus at that period. For it is the relation in shape of the

fœtus to the uterus—of the contained to the containing body—that regulates this position. And the maintenance and restoration of the position is effected by reflex movements, when its continuance is from time to time threatened to be interrupted by movements of the mother's body, or by other circumstances affecting the conditions and relations of either the uterus or infant.

The form of the uterus at the full term of utero-gestation is ovoid. See the outline of it from Hunter's most accurate drawing, in Plate II., Fig. 1. "The general figure of the uterus at this time is," says Dr Hunter,¹ "oviform; the fundus answering to the largest extremity of the egg, and the cervix and os uteri to the small end; but the fundus is larger and more flat, or less pointed, in proportion to the lower extremity of the uterus, than one end of an egg is to the other; and the whole uterus seems more or less compressed, so as to be broader from right to left than it is from the fore part backwards."

In the pregnant uterus represented in Plate I., and belonging to Professor Goodsir, the whole length of the cavity of this organ is twelve inches and a half. The broadest part of the cavity is four and a half inches from the fundus, where it measures eight inches across. From this point the organ gradually diminishes in breadth, and tapers downwards towards the cervix. Across the cervix, about three inches above the os, it is about four inches in breadth.

The form of the fœtus as it lies rolled up in utero at the full term of pregnancy is ovoid, like that of the uterus itself. "The fœtus," says Velpeau,² "forms an ovoid mass, whose large end, turned towards the fundus of the uterus, is represented by the pelvic extremity of the trunk, and the summit (small end of the ovoid) is represented by the cephalic extremity, which rests upon the cervix of the uterus." In Mr Goodsir's preparation (see Plate I.), the broadest part of the larger or pelvic end of the ovoid mass of the fœtus measured nearly eight inches, and ran in a line from the lumbar region of the child across nearly to the point where the sole of the foot was applied to the placental surface. The breadth of the smaller or cephalic end of the ovoid (formed by the occipito-frontal diameter of the head) measured about four inches. In other words, the lower end was nearly a half narrower than the upper and broader end of the fœtal ovoid.

The figures 1 and 2, given in Plate II., represent in outline the ovoid form of the uterus, and the ovoid form of the fœtus at the full term of pregnancy, according to the preceding description of the relative shape and configuration at that time.

Towards the end of pregnancy the fœtus is situated in the uterus,

¹ Anatomical Description of the Human Gravid Uterus, p. 3.

² *Traité des Accouchemens*, tom. i. p. 333.

so that the two ovoids which the fœtus and uterus form are relatively adapted to each other; that is, the broad or pelvic end of the ovoid of the fœtus, is placed towards the broad or upper end of the ovoid of the uterus; while the narrow or cephalic end of the ovoid of the fœtus, is placed towards the narrow or lower end of the ovoid of the uterus. The narrow and broad ends of the ovoid mass of the fœtus, are relatively adapted to the narrow and broad ends of the ovoid cavity of the uterus. The figure of the contained body (the fœtus) thus comes to correspond with the figure of the containing body (the cavity of the uterus), and is, as it were, fitted into it. Fig. 3 in Plate II. represents the one ovoid (Fig. 1) thus adapted to the other ovoid (Fig. 2).

At the advanced time of pregnancy of which we are speaking, when the uterus and fœtus are normal in shape and size, the fœtus cannot be placed transversely in the uterine cavity, so as to form a transverse or arm presentation, as there is not room for it to lie in that position. For the long axis of the ovoid mass of the fœtus is about twelve inches; the greatest breadth of the uterus is only eight inches; so that the latter could not receive the former. For the same reason, when once the position with the head downwards is assumed, it comes to be difficult or impossible for the child near the full time to move round in utero, so as to turn its pelvic, instead of its cephalic extremity downwards, and towards the os. In fact a compressible body of twelve inches in length, such as the rolled up fœtus is, cannot readily move through a space of only eight or nine inches, even though that space, like the transverse axis of the uterine cavity, be capable of dilatation and forcible alteration of shape.

At, and towards the full term of utero-gestation, the position of the fœtus with the head lowest, is thus greatly maintained by the relative *physical* adaptation of the ovoid shape of the rolled up mass of the fœtus, to the ovoid shape of the interior of the cavity of the uterus. But this particular adaptation and position of the fœtus in the uterine cavity, would be often lost if no other additional and *vital* means were in operation; as we see indeed often happen when the child dies. The other additional vital means, by whose influence this special position is still further, rigorously and carefully sustained, consists of the restoring influence of reflex motions on the part of the fœtus itself. For, let the relative adaptation and position of the fœtus be partially disturbed (as readily happens by any movements of the mother, as, for example, by her suddenly assuming the upright or supine postures, or other such causes), and immediately the fœtus, by a series of reflex movements of its extremities, particularly of its lower extremities, acts till it regains its former perfect position. It moves, in other words, till it has retaken that position in which it is most free from any marked excitations or compressions upon the external surface of its own body.

It is perhaps unnecessary to add, that seeing the fœtus is placed in

the liquor amnii, a fluid medium of high specific gravity, and is consequently subjected to an uniform amount on all sides of hydrostatic pressure (considerably neutralizing the force of gravity upon its mass), its existing position is easily altered by changes of position and motions on the part of the mother, and consequently on the part of the containing body—the uterus. But for exactly the same physical reason by which the position of the foetus is thus rendered easily capable of change and alteration, the physical powers and means necessary for the restoration of it to its proper position are correspondingly simple. Floating as it does in a liquid medium, the motions of its extremities in that medium, and against the uterine walls, are easily and perfectly adequate, as a mechanical means of motion, to enable it to swim back to, and resume that normal and adaptive position in which it lies most free from extraneous excitations, and from the irritation of disturbing impressions or stimuli upon its own surface. In some mothers the position is apparently easily maintained; the infant and uterus are perfectly adapted to support each other; and consequently the child moves little. In other mothers, or in the same mother in other pregnancies, the movements are nearly incessant. In those cases in which the movements of the infant are great and continuous, the umbilical cord is generally found long, and hence liable to compression; or the cavity of the uterus is large and distended from an excess of liquor amnii, and almost constant movements are required on the part of the foetus to prevent its almost constant tendency to displacement or compression. The nearly uninterrupted constancy of the foetal movements in some mothers, exists to a degree greater than is observed in any voluntary muscular movements. But the excess of foetal movements corresponds in this respect with the law of constancy, which regulates other corresponding excito-motory movements in the animal economy. Voluntary muscular movements always become temporarily arrested and interrupted from time to time; because, from time to time, volition, like other cerebral acts, must temporarily cease for the purpose of rest and renovation. Fatigue, and its antidotes repose and sleep, necessarily belong to the cerebral system; but the spinal system never sleeps, and the reflex or excito-motory muscular movements over which it presides, are not susceptible of fatigue, and do not necessarily require any intermission in their action. It is on this principle that respiration in man is unattended by fatigue, and that “the long flight of birds in their migrations, and of flies, which are all the day long on the wing, is sustained.”¹ Some of the reflex or excito-motory movements of animals which show this law of con-

¹ Diseases of the Nervous System, p. 26; “I suspect, indeed, that the migratory traveller is frequently actually visited by nature’s sweet rest, even during its aerial transit.” New Memoir, p. 32. The young infant often evidently continues the act of sucking (an act of the spinal or reflex system) while the cerebral system is asleep.

stancy, have the same object and effect as the reflex movements of the fœtus; viz., the maintenance of position. Thus, the fish holds and maintains its position in the stream by constant reflex movements of the fins and tail.

2.—*Mode of Assumption of the Natural Position of the Fœtus with the Head downwards.*

I have already stated (p. 6) that the position of the fœtus, with the head over the os uteri, is not observed till the latter months of utero-gestation; that in fœtuses expelled before the end of the sixth month, presentations of the feet or pelvis are as frequent as presentations of the head, and presentations of the shoulder by no means infrequent; and that the position of the head lowest, and towards the os uteri, comes to be taken with more and more certainty from the end of the sixth month, onward to the full term.

From the observations collected by Professor Dubois at the Maternity Hospital of Paris, I have constructed the following table in evidence of the preceding remarks. The respective results of the presentations among children born before the end of the sixth month, during the course of the seventh month, and at the full time, include, it will be observed, all cases whether the child were alive or dead at the time of its expulsion. The return for the eighth and ninth months, refers only to children born dead. He does not give any return relative to the children born alive during these two months.

Table of the Relative Proportion of Head Presentations, as varied by the date of the Pregnancy or Labour.

Period of Pregnancy.	Total Cases.	Presentations of			Per centage of Head Presentations.
		Shoulder.	Breech.	Head.	
Before end of sixth month,	121	5	51	65	52 in 100
During seventh month,	119	6	31	82	68 in 100
During eighth and ninth months, }	96	2	22	72	76 in 100
At full term of gestation,	100	1	3	96	96 in 100

The facts in this table sufficiently prove that the position of the fœtus with the head lowest and over the os uteri, does not begin to be assumed till about the end of the sixth month, and that it is taken up with increasing frequency and certainty from that period onward to the full term of pregnancy.

The double fact of the position not being assumed before the period in question, and of its being more and more positively and steadily assumed after this period, is simply, I believe, ascribable to the circumstance, that before the sixth month there is no adjusting correspondence of figure between the uterus and fœtus; while, after

the sixth month, the figure of the one comes to correspond more and more to the figure of the other, and consequently requires more and more the containing body to be placed in the containing cavity in that kind of relative adaptation which has been already described.

All anatomical authorities allow that the uterine cavity before the sixth month¹ is spheroidal, and not ovoid, the neck of the organ not yet being developed and taken up to form part of the cavity. The foetus, up to this time, is not folded up so compactly as afterwards, or moulded into its ultimate ovoid form. Further, at the same period the uterine cavity is not only roundish in form, but is relatively much larger in regard to the foetus—for it contains a large quantity of liquor amnii.² After the sixth month these various circumstances are gradually altered. The cavity of the uterus becomes more and more ovoid in form, from the development of the cervix; the quantity of liquor amnii becomes less and less, relatively to the increasing size of the uterus and infant; the infant itself becomes in a greater and greater corresponding degree deprived of space—is forced to alter its shape and position according to the shape and form of the uterine cavity—becomes more folded and compacted together, because its containing space is less—and ultimately becomes comparatively fixed in the position which it is thus forced to assume. “In the last two or three months of gestation, the child,” observes Dr Hunter,³ “is commonly so much straitened for room, and so compactly adapted to the oblong figure of the uterus, that it cannot change its general position either by its own efforts, or even by accidents happening to the mother.” “When,” he elsewhere remarks,⁴ “there is a considerable quantity of liquor amnii, the child takes the advantage of room, and the composition of its parts is not so close or globular. In proportion as there is less room, its figure is more compacted and moulded to the shape of the cavity of the uterus.”

These changes, however, in the physical shape and size of the uterine cavity, relatively to the physical form of the foetus, would not produce of themselves the position with the head over the os uteri. The dead child does not take this position. If the child has been alive

¹ See Plate II. Fig. 4, sketched and drawn from a case of five or six months pregnancy, delineated by Breschet and Velpeau.

² “The relative proportions,” says Ramsbotham, “between the quantity of fluid and size of the embryo, differ much at different stages of pregnancy, being considerably greater at the early periods, and less at the advanced stage. Thus when the embryo is scarcely visible to the naked eye, there is from half a drachm to a drachm of water collected within the membranes. Where the embryo is not so large as a small kidney bean, there would be an ounce or more of liquor amnii; while at the end of gestation, when the foetus weighs, on an average, nearly seven pounds, the amount of fluid seldom exceeds a pint. The quantity, therefore, though positively increasing with the growth of the ovum throughout the whole of gestation, is relatively to the size of the foetus gradually diminishing.”—*Obstetric Medicine and Surgery*, p. 69.

³ Anatomical Description of the Gravid Uterus, p. 67.

⁴ *Ib.* p. 63.

up to the seventh, or eighth, or ninth months, and has in consequence assumed the position in question, but then dies—the position is liable to be lost from the death of the child. At pp. 10 and 11, I have given two tables proving this fact, and showing how much the assumption, as well as the maintenance of the position, with the head downwards, is a vital act, and connected with the existence of life in the child. The regulating vital power guiding it to the assumption of that normal position in which its figure corresponds as exactly as possible to the figure of the uterine cavity, consists of a succession of reflex or excito-motory movements of an adaptive kind on the part of the fœtus, excited by impressions made on its external surface. In order fully to understand their action, we shall next briefly consider the origin and effects of those adaptive reflex movements, which thus contribute not only to the original assumption, but to the continued maintenance of the position of the fœtus,—and force it to take up, retain, and restore itself to that special position in the uterine cavity in which it can lie with its form more perfectly adjusted than in any other position to the form of the uterus, and with its own excitor surfaces more removed than in any other position from the action of external impressions and stimuli.

3.—*Nature of the Physical Impressions, or Stimuli, exciting Reflex Movements on the part of the Fœtus.*

“All animals,” says Harvey, “while they are at rest or asleep, fold up their limbs in such a way as to form an oval or globular figure. . . . So, too, the infant in utero is generally disposed after this manner. In such a position is the embryo usually found as that which we naturally take in sleep.”¹ This folded up state of the limbs and body of the fœtus is primarily the effect of the well known greater muscular tone and contraction of the flexor than of the extensor muscles. Of the power and preponderance of the flexor over the extensor set of muscles, we have evidence remaining for some time after birth, in the almost constant state of flexion which may be observed in the extremities, and particularly in the lower extremities of the new-born child, when unirritated and at rest. It is not in general for some considerable time after birth that the child acquires the full power of extending the lower extremities. And, no doubt, this superior tone and contraction of the flexor muscles is one of the means by which the necessary ovoid form of the fœtus in utero is maintained. But while this physiological principle² accounts for that form and figure of the fœtus which best adapts it for the form and figure of the uterus, we

¹ Harvey's Works (Sydenham Society Edition), p. 522.

² Dr Hall, it is well known, holds that the reflex function, in its natural state, constitutes the principle of equilibrium and tone of the whole muscular system.—*Memoirs on the Nervous System*, 1837, p. 38.

must have recourse to the acts of the reflex system in another view, in order to account for the adaptive position, or rather adaptive movements of the fœtus. These movements are reflex. And it is laid down as an established physiological law, that "the reflex nerves are in every case, without an exception, excited to action by the impressions of *physical* agents acting on the peripheral extremities of incident nerves;"¹ and "that the reflex power is never exercised without the excitement caused by the application of a physical agent either to the external or internal *surfaces* of the body."²

In relation to the movements of the fœtus in utero, let us next, then, inquire what physical agents produce the required excitor impressions, and on what surface, or the peripheral extremities of what incident nerves, these impressions act?

Various physiologists have pointed out that, when in the lower animals the head is removed, or the spinal cord is divided, and sensation thus abolished, the mere touching or irritation of the *skin* is followed by more or less complex movements in the *muscles* of the extremities and trunk. Whytt, for example, long ago "remarked that, after decapitation, frogs and serpents performed movements of the limbs or entire body, consequent upon the application of a stimulus to the skin."³ "In the frog," says Mr Grainger,⁴ "in the rabbit, kitten, &c., after all feeling and volition is lost, the *limbs* are moved when the *skin* is touched." The movements thus excited under these conditions (decapitation and division of the cord) are evidently reflex or excito-motory, and the facts prove how powerful an excitant surface *the skin* is, and how easily irritations of it act in calling up or producing reflex muscular movements. "No part," says Müller, "equals the skin in the property of exciting reflex motions; the slightest touch applied to the surface, in animals in a state of narcotization, is frequently sufficient to give rise to strong spasms,

¹ Grainger's Observations on the Structure and Functions of the Spinal Cord, p. 50.

² Ibid, pp. 119, 129.

³ Ibid, p. 3.

⁴ Ibid, p. 49.—"Every physiologist," says Mr Grainger, "who has divided the spinal cord in living animals, and has then pricked or otherwise irritated the *skin*, has remarked the free motion which is thereby caused in the muscles which are called voluntary,"—p. 100. When the spinal cord is divided, "the foot of the rabbit is not only drawn away from the irritation, but the whole limb, occasionally even both legs, are thrown backwards, with all the complicated motions that occur when the creature runs. In the frog, if the cord be divided sufficiently high, both hind legs often strike out when one is touched, not in the manner of the rabbit, but with the very action that occurs in swimming. The chicken, in the experiment of Flourens, when deprived of all volition, flew when thrown into the air. Lastly, in the human body, the legs may be incited to motion, when all voluntary power is destroyed, by tickling the sole of the foot. It is thus proved, beyond the possibility of a doubt, that motions similar to those performed in the progression of the animal may be excited by touching *the skin*, when volition and sensation are destroyed,"—p. 150.

while the reflex actions excited by irritation of the nerves themselves are much slighter.”¹

I have already stated (page 18) that movements of the limbs of the child are readily produced *after* the period of its birth, by irritation of the sole of the foot and other parts of the cutaneous surface; that *during* birth, and while labour is going on, similar movements can be produced by similarly irritating the presenting part of the child; that *before* birth, or, in other words, during pregnancy, the same kind of movements is excited by irritating the limbs or body of the fœtus through the abdominal or uterine walls by the hand, stethoscope, &c.; and that in all these cases the movements thus produced are reflex or excito-motory, and not voluntary, inasmuch as they occur in anencephalous fœtuses entirely wanting a brain, as distinctly as in those that are normal in structure.²

Cutaneous impressions, or physical irritations applied to the peripheral extremities of the incident nerves distributed to the surface of the skin, are thus capable of producing reflex-motory actions on the part of the infant, and are, perhaps, the most common cause of excitement of the muscular movements of its extremities, and consequently of its changes of position. If the fœtus be temporarily thrown out of position by any movements on the part of the mother, and if the surface of its body thus become irritated at any point or points by mere pressure from or against the opposing uterine parietes, or other resistant substances, this pressure (like the pressure of the hand or stethoscope, alluded to in the preceding paragraph) will act as an excitor stimulus, calling up reflex motions calculated and empowered to move away the irritated and compressed limb or body from the agent or source of the irritation. Different postures of the mother, when suddenly assumed, by both displacing the fœtus and altering the shape of the uterus so as to make its parietes press upon the fœtus, are followed for a time by a succession of movements on the part of the infant.³ Thus the acts of suddenly rising or suddenly lying down excite almost constantly, in certain women,

¹ Müller's Physiology (Baly's Translation), vol. i., p. 322; see also Longet, Anatomie et Physiologie du Système Nerveux, vol. i., p. 318.

² Unzer, whose remarkable works contain such clear and comprehensive views, in many points, of the physiology of the nervous system, makes a remark upon this subject which is too striking to omit in evidence. "A living anencephalous monster, when born, draws itself up, if you puck or burn its limbs, and that plainly through a reflex operation of the nerves—[durch eine blosse nervenwirkung zurück]—as a natural new-born child would do, if you made the same external impressions upon it."—*Erste Gründe einer Physiologie*, p. 552.

³ "That the different attitudes of the mother's body should produce alterations in the figure of the uterus, needs not now a particular explanation or proof. The weight of the uterus itself, and of the adjacent viscera, being differently directed, must produce some change of posture, especially as the parts against which the uterus will rest its weight in the different postures of the body are of such different natures."—*Hunter's Anatomical Description of the Gravid Uterus*, p. 4.

motions on the part of the child. When some mothers stoop or lean forward, they alter the shape of the uterus, and compress the child so greatly as to call up instantly such strong foetal motions as to oblige them immediately to assume the erect posture. And the foetus sometimes throws itself into positions which excite new movements on its own part. In the latter months, "it is frequently evident," says Dr Hunter,¹ "that some awkward straightened position of the child being produced by its own motion, and pressing or stretching the uterus unequally, gives the mother much uneasiness for a time; and then, upon the child's stirring in some remarkable way, it gets to be more at its ease, and the mother feels instant relief from the pain, the stretching, or whatever the complaint was. This will happen to the same woman again and again."

In the various cases and conditions which I have mentioned,² the *cutaneous* impressions and stimulations call up reflex *motions* in the foetus according to the laws laid down by all those physiologists who have written upon the subject of excito-motory phenomena. "An impression is made," to use the language of Dr Marshall Hall, "upon the extremity of a nerve (or nerves); this impression is conveyed, not to the cerebrum, but to some part of the medulla oblongata or medulla spinalis, whence it is reflected upon certain muscles destined to be excited into consentaneous action."³ "The external impressions," as Prochaska⁴ writes it, "that are made upon the sensorial nerves, are most swiftly propagated along the whole length of the nerves to their origin, where, when they have arrived, they are reflected according to a certain law, and pass on to certain and corresponding motor nerves, through which, being again very swiftly propagated to muscles, they excite certain and determinate movements." The views which Prochaska took of the general object and aim of such reflex or excito-motory movements are precisely those

¹ Anatomical Description of the Gravid Uterus, p. 67.

² All the conditions I have spoken of in the text relate to cutaneous irritations and impressions acting as stimuli to reflex motions. In cases of prolapsus of the umbilical cord, compression of the prolapsed funis by the fingers or otherwise seems generally to lead to a series of reflex movements of the body and limbs of the foetus. During pregnancy this may be one of the means employed by nature to prevent, more frequently than otherwise would happen, the position of the cord between the child's head and the interior of the uterine cervix. It is certainly remarkable that we do not meet with this position of the cord more frequently, when we consider its length and its greater specific gravity than the liquor amnii. If, when so placed, and consequently compressed, reflex foetal movements were always excited, this circumstance may possibly be the means of leading to, or producing, one other result—viz., the ultimate course and twisting of the cord around the body, neck, or limbs of the foetus; in other words, such convolutions of the cord around these parts may be the result of sanitary reflex movements on the part of the foetus—these sanitary reflex movements originating in, or being excited by, some unsafe or uneasy compression of the cord itself.

³ Memoirs on the Nervous System, p. 70.

⁴ Annotationes Academicæ, fasc. iii., p. 114.

which are attained by the aforesaid movements of the fœtus in utero. "The general law," he observes, "by which the common sensorium reflects sensorial impressions into motory, is the preservation of the individual (*conservatio nostri*); so that when external impressions act that are hurtful to our body, there follow certain motory impressions producing motions combined for the purpose of removing and driving away this irritation from our body; and, on the contrary, when external or sensory impressions act that are grateful to us, there follow internal or motory impressions productive of motions, having for their object the further maintenance of this grateful condition."¹

All the so-called voluntary or motory muscles of the fœtus are not excited to an equal degree, or with equal facility, by the action of the physical impressions or stimuli to which it is subjected. The muscles of the trunk and upper extremities are much less moved under these stimuli than the muscles of the lower extremities are. Various authors have remarked incidentally, and without a view to any theory, that apparently the lower extremities move in utero much more than the upper.² Indeed, for some time after birth the movements of the legs continue to be greater in degree and extent than the movements of the arms. In the fluid medium in which it lies and swims in the uterine cavity, the motions of the lower extremities of the fœtus are more useful and powerful in enabling it to maintain and resume its position than any movements of the upper extremities could be.—And even in the adult, when the influence of the mind and cerebral system is withdrawn, reflex movements are far more easily excited as in the fœtus, in the lower than in the upper extremities. When a man receives an injury, producing fracture or displacement of one or more of his cervical vertebræ, and paraplegia in consequence is produced, "we find," says Dr Todd, "the patient presenting the following phenomena. His trunk and extremities appear as if dead (except the movements of the diaphragm); while the head lives. In full possession of his mental faculties and powers, he is, nevertheless, unconscious, save from the exercise of his sight, of any changes which may affect the parts below his head, nor is the utmost effort of his will sufficient to produce a movement of any, even the smallest, of these parts. If the stunning effect of the accident have passed off, tickling the soles of the feet will be found to cause movements, of which, as well as of the application of the stimulus, the patient is unconscious. The limbs may be irritated in various ways, but without exciting any effects which the patient can perceive, excepting movements, and these he is aware of only from his happening to see them. It is *important* (adds Dr Todd) to notice that, in cases of this

¹ Annotationes Academicæ, p. 117.

² Thus, for example, Professor Dubois observes, "Il ne faut pas oublier que les grands mouvemens du fœtus, et les plus ordinaires sont ceux qu'exécutent les extrémités abdominales."—*Memoires de l'Academie*, vol. ii., p. 285.

kind, movements are difficult of excitation in the *upper* extremities, while they are aroused with great facility in the lower." ¹

4.—*Are there any parts of the Cutaneous Surface peculiarly susceptible of the appropriate physical impressions or stimuli leading to the Reflex Motions of the Fœtus?*

In the fœtus after birth some parts of the cutaneous surface, when stimulated, give rise much more readily than others to reflex muscular motions. In the adult the skin of the soles of the feet, of the knees, and of the sides, are thus specially susceptible. In other words, these parts are more sensitive than other parts to the irritation of touching or tickling. This over-susceptibility in the cutaneous nerves of these special parts is of no apparent use in the adult; and yet there is no property without its utility. It becomes generally more and more diminished and lost as life advances, and is greater in degree the younger the person, and greatest of all in the infant. Has this property not *its* special utility in the infant before birth? The parts of the fœtal surface most exposed to external irritation, the soles of the feet, knees, and sides, as seen in Plate I. and Plate II., are exactly those parts which are super-sensitive after birth to cutaneous irritation, and which most readily produce reflex movements of the limbs, in consequence of their cutaneous irritation. In a new born infant irritation of the sides of the chest is followed by more or less strong movements of both lower extremities. Rubbing or tickling the soles of the foot immediately excites a movement of change of position and retraction. "Certain localities," says Dr Hall, "are more susceptible than others to the effects of the excito-motory stimulus—the sole of the foot is especially one of these. Dr Little," he continues, "has published an interesting case of distortion of the foot, which only, but uniformly, occurred when it was placed upon the ground. Dr Dieffenbach met with a similar case" ²

In anencephalous infants the same special parts of the cutaneous surface are principally or solely those through the irritation of which muscular movements are excited, when such infants survive after birth. In his Croonian Lecture on Muscular Motion, Sir Gilbert Blane describes some experiments upon a kitten which he decapitated, and upon another in which he divided the cord; and he states that after these injuries of the nervous centres, when the hind paws were irritated, "the muscles belonging to the posterior extremities were thrown into contraction, so as to produce the motion of shrinking from injury." He subsequently adds, "In an acephalous monster the like phenomena were observable. It moved up its knees when the *soles* of its feet were tickled, &c." ³

¹ Physiology of the Nervous System (Encyclopedia of Anatomy), p. 19
See also Todd and Bowman's Physiological Anatomy, vol. i., p. 334.

² Diseases and Derangements of the Nervous System, p. 117.

³ Select Dissertations on Medical Science, p. 262.

The results of pathology strikingly prove that there are some portions of the cutaneous surfaces which are much more susceptible than others, of producing reflex muscular movements, under the application of appropriate excitants. This is particularly seen in some cases of complete paraplegia depending on disease or division of the spinal cord,—and where all power of sensation and volition is abolished, as far as the paralyzed limbs are concerned. In instances of this kind, described by Drs Hall, Barlow, Budd, and others, the muscles of the paralyzed limb, though in no way obedient to volition, were capable of being excited into temporary action by various irritations of the cutaneous surface of the limb, but particularly by tickling of the sole of the foot.¹ Thus, in a case described by Mr Grainger, “a girl about fifteen years of age, was affected with angular curvature of the spine, producing insensibility and paralysis of the lower extremities. On tickling the *soles* of her feet, which, as an experiment, was often done, the legs were immediately slightly retracted, although the patient said she felt nothing; it was further remarked, that on touching the *other* parts of the feet or the legs in the same manner, no effect was produced.”² “The results,” observes Mr Grainger, “noticed in these cases are full of interest. They prove, first, that in parts of the body indisputably deprived of all feeling and power of voluntary motion, contraction may be excited in the so-called voluntary muscles, by impressions made on the skin; secondly, that this capacity of exciting muscular contractions, is not equally possessed by all parts of the external surface of the body, but that the *sole* of the foot is that precise part in which the action is excited in the most energetic manner.”³

In cases of hemiplegia, particularly when the paralysis is complete, the same phenomena may be frequently observed. “In such cases,” observes Dr Todd, “it is wonderful how easily movements may be excited in the palsied leg—very rarely in the arm, by the application of stimuli to the *sole* of the foot, or elsewhere with less facility. The patient, who acknowledged his utter inability to move even one of his toes, is astonished at the rapidity and extent to which the *whole* lower extremity may be moved by *touching* the sole of the foot, even with a feather.”⁴ The development of these excito-motory phenomena in paralytic cases is frequently (adds Dr Todd), “in the inverse proportion of the withdrawal of the power of the will.”⁵ And in the same way, and on the same principle, the *excito-motory reflex* muscular movements of the fœtus are probably only the more marked in

¹ See Diseases of the Nervous System, p. 233, &c. &c.

² Observations on the Spinal Cord, p. 94.—³ Ibid, p. 94. See also Dr Budd's paper in *Med. Chir. Trans.*, vol. xxii., p. 187: “Impressions on the *soles* of the feet were more efficient than any that were tried on other parts of the skin.”

⁴ Physiology of the Nervous System, p. 19.

⁵ See also Dr Budd, in *Medico-Chir. Trans.*, vol. xxii., p. 186: “The reflex movements varied in extent and force, inversely with the degree of voluntary power.”

degree and extent, in consequence of the absence during intra-uterine life, of all volitional and other mental influences. This remark leads us to a new subject, viz. :—

5.—*The degree of Reflex or Excito-Motory Movements manifested by the Fœtus in Utero, and the Period of their Commencement.*

In adult life the influence of, and susceptibility to, reflex movements in the so-called voluntary muscles of the trunk and extremities, is masked by the predominating power and effects of the mind and cerebral system over these same sets of muscles. Their excito-motory activity, however, is only obscured, not obliterated. Disease, by sometimes separating the influence of the cerebral system from the influence of the spinal system over these muscles, proves to us the persistence of their excito-motory activity, as in the cases of paraplegia and hemiplegia, adverted to in the two preceding paragraphs. These cases shew us by a kind of pathological analysis, that even in the adult, when the motory muscles of the trunk and extremities are withdrawn from the psychical nervous influence of the cerebral system, they are still found remaining subject to the physical nervous influence of the reflex or spinal system. "The truth," remarks Dr Hall, "is that the intellectual functions are daily developed during the first years of life, and obscure those of the excito-motory; but the latter are not enfeebled during this change, which is one of super-addition, not of substitution."¹

All modern physiologists, however, admit that reflex or excito-motory movements are more distinctly and more powerfully developed, and are entrusted with the performance of more and more important functions in the animal economy according as we descend in the scale of animal life, and consequently also in the scale of individual life. In other words, the younger the individual is, the more evident and marked, as a general rule, is the power and influence of the reflex movements. "It is worthy," says Dr Hall,² "of special observation, that, in the very young animal, and in the cold-blooded animal, the phenomena of the excito-motor power are far more vividly manifested than in the older and the warm-blooded. In the very young kitten, even when asphyxiated to insensibility, every touch, contact, or slight blow—every jar of the table, any sudden impression of the external air, or that of a few drops of cold water—induces at once energetic reflex movements and acts of inspiration. The nostrils, the tail, the soles of the feet, the general surface, are all extremely susceptible, and in degree in the order in which I have mentioned." "Phenomena of this nature," observes Professor Todd, "may be produced in all vertebrate animals. They are, however, especially marked in the cold-blooded classes. In the young of warm-blooded animals they are more manifest than in the adults of the same class."³

¹ Diseases and Derangements of Nervous System, p. 138.

² New Memoir on the Nervous System, p. 29.

³ Physiology of the Nervous System, p. 18.

In accordance with the principle stated in the preceding paragraph, we ought to expect the manifestations of reflex movements to be well marked in the fœtus. And the whole of the present inquiry is intended to show that they are so, in particular sets of muscles, viz., in those connected with the general movements of the body. Other sets and combinations of muscles subject to excito-motory action after birth, as those of inspiration, suction, deglutition, defecation, &c., &c., are still in the state of absolute quietude during intra-uterine life, because the appropriate physical stimuli calculated to excite these reflex movements, are never applied till extra-uterine life is commenced, and because their action during intra-uterine life would be dangerous and even fatal to the fœtus. On the other hand, we have seen that the appropriate stimuli, calling into exercise the motory muscles of the trunk and extremities are applied during intra-uterine existence; and the action of these muscles is necessary on the part of the fœtus, in order to enable it to assume and maintain its position with the head downwards, an action which is in itself characterised by being intimately connected, as other excito-motory actions are, "with the preservation of the individual, and the propagation of the species."¹

In several parts of his works, Dr Hall speaks of the extent of the phenomena referable to the nervous system that are manifested in fœtal life. But in consequence of not adverting to some of the points which have been attempted to be stated in the preceding pages, he takes too limited, and consequently, as I am inclined to believe, an erroneous view of the extent of the excito-motory or reflex muscular movements and actions that occur during intra-uterine life. "The fœtus in utero seems," says he, "restrained to a sort of ganglionic life. Every thing consists in nutrition and growth, or development. The contact of the liquor amnii is sufficient to keep the eyelids, the lips, and the sphincters closed."² "The fœtus in utero is," he again observes, "so little exposed to the influence of stimulants, or excitants applied to the cutaneous or mucous surfaces, that the excito-motory property is comparatively little called into action in the form of the reflex function. The contact of the liquor amnii may preserve the lips or the larynx, and the sphincter ani, closed. In this manner, the reflex function, or the function of exclusion and of retention is in activity; but, as the agent in ingestion and egestion, it is as if it did not exist."³

In these, and the other passages in which he alludes to the state of the nervous system of the fœtus, Dr Hall nowhere, as far as I am

¹ The "functions" of the "true spinal excito-motory system" are, as repeatedly explained and laid down by Dr M. Hall, those functions of the economy "on which depend, 1, the preservation of the individual; and 2, the continuance of the species."—*Diseases of the Nervous System*, p. 39, &c; *New Memoir*, p. 51; &c.

² *Diseases and Derangements of the Nervous System*, p. 131.

³ *Diseases and Derangements of the Nervous System*, p. 243; see also p. 113, &c.

aware, adverts or alludes to the strong and well marked reflex movements and actions performed during intra-uterine life by the motory muscles of the trunk, and particularly of the limbs of the fœtus, and which constitute, as I have endeavoured to show, the mechanism by whose instrumentality nature ultimately effects and produces in the human uterus, the normal and salutary position of the child with the head downwards and over the os. At what period of intra-uterine life reflex movements first commence in these so-called voluntary muscles, we have no power of precisely determining. The exercise of these reflex movements is not essential for the principal object which they seem intended to accomplish (namely, the proper position of the fœtus), till the latter period of pregnancy. But the fœtus is usually felt by the mother moving as early as the middle term of utero-gestation; and stethoscopic observations show that they are often present to some extent before they come to be perceived at the time of quickening. "During the early stage of pregnancy," says Nægele, "while the fœtus is very small in proportion to the size of the cavity which contains it, and while the free movements of its limbs are consequently unrestrained, sounds produced by the movements of the fœtus may be occasionally distinguished as gentle taps repeated at intervals, and continued uninterruptedly for a considerable time. These sounds may sometimes be distinguished *several weeks before* the mother becomes conscious of the motion of the child, and also earlier than the pulsations of the fœtal heart, or the uterine souffle."¹

In comparative physiology, we may have even *ocular* proof of the early commencement of reflex or excito-motory movements in the limbs, &c., of the embryo. In marsupial generation, the embryo, as is well known, leaves the uterus very early, and becomes immediately affixed to the nipple protruding in the interior of the marsupial sac, where it continues its development and growth. In the kangaroo, the embryo is expelled from the uterus as early, according to the observations made by Professor Owen, as the thirty-ninth day. An embryo of the kangaroo expelled at that period, was watched and examined by Mr Owen, and to use his own words, it "resembled an earth-worm in its colour and semi-transparent integument," and in the degree of development, its brain corresponded to that of the human embryo at the ninth week. Yet, in this early stage of development, the existence in it of reflex actions and movements was most distinct, for it breathed, *moved its limbs when touched*, and fixed upon the marsupial nipple. "It adhered freely," says Mr Owen, "to the point of the nipple; breathed strongly but slowly, and moved its fore legs when disturbed."²

¹ Treatise on Obstetric Auscultation, p. 50.

² Cyclopædia of Anatomy—article Marsupialia—Vol. III., p. 322.

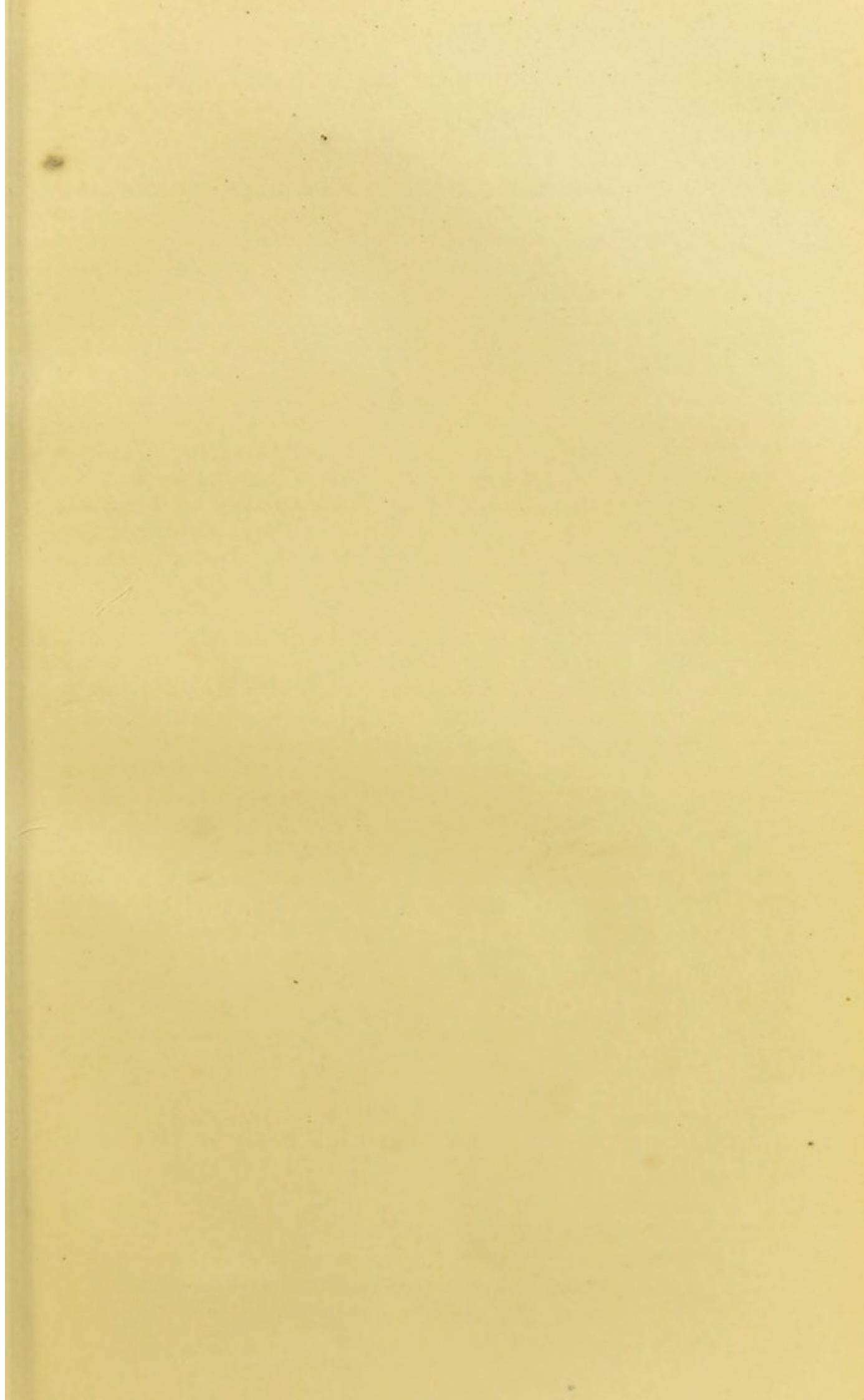


Plate III

Fig. 1.

Position of Twins. (from Smellie)

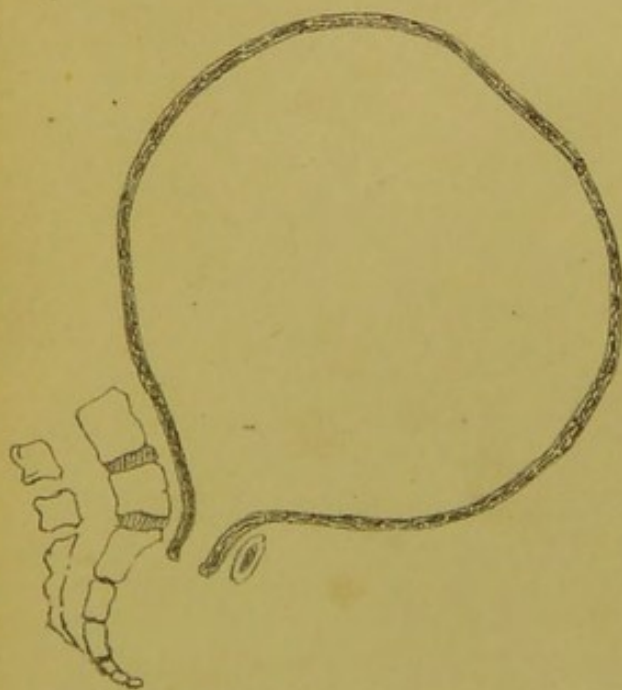


Fig. 2.

Hydrocephalus as affecting Position.



Fig. 3.

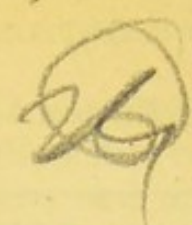


*Form of Uterus in
Cesarean Operation.*

Fig. 4.



*Form of Uterus in Breech
Presentation (from Chailly)*



PART III.

.....

SECTION IV.—MALPRESENTATIONS OF THE FŒTUS ; THEIR CAUSES AND MODES OF PRODUCTION.

HITHERTO we have spoken only of the usual and common position of the fœtus with the head downwards, and presenting over the os uteri. But other parts of the fœtus than its head sometimes present over the uterine orifice in the latter months of utero-gestation, and during labour. When any other region than the head of the fœtus presents, the resulting "malpresentation," or "preternatural presentation" (as it is generally termed), is one of two kinds, viz., either the presentation of some part of the pelvic end of the ovoid mass of the fœtus ;—or the presentation of the lateral surface of the trunk, but particularly the shoulder or arm. In other words, the full grown infant, at the time of labour, is practically found to present over the os uteri in one of three different modes, namely—1, with its head (or cephalic extremity) ; 2, with the nates, knees, feet (or pelvic extremity) ; or, 3, it may be situated transversely across the uterine cavity, and hence present a side, shoulder, or arm at the uterine orifice. In a previous part I have already given the following table, with the view of showing the relative proportion in which these three leading orders or genera of presentations of the fœtus are observed to occur in practice, as deducible from the extensive reports on the subject, published by Lachapelle, Boivin, Clarke and Collins.

Table of the Relative Number of Cases in which the Presentation of the Child was found Cephalic, Pelvic, and Transverse.

Reporter.	Total No. of Cases.	No. of Head Presentations.	No. of Pelvic Presentations.	Number of Transverse Presentations.
Lachapelle,	37,126	35,550	1390	186
Boivin,	20,517	19,810	611	96
Clarke,	10,387	10,094	245	48
Collins,	16,654	16,102	504	48
Total,	84,684	81,556	2750	378
Proportions.		96 in 100	1 in 31	1 in 224

In the preceding sections we have seen the difficulties with which all theories of the natural and common attitude of the foetus with the head lowest, have heretofore been confessedly beset. And it can easily be conceived, that if the rationale of the cause of the natural position of the foetus has been a matter of doubt and uncertainty, the explanation of any deviations of the foetus from that natural position has necessarily been involved in still greater dubiety and difficulty.

Indeed, though most systematic writers in midwifery have theorised more or less fully upon the subject of the natural position of the foetus, and its supposed cause or causes—few of them have, in any degree, entered into the consideration of the cause or causes of its malpositions, or malpresentations; and of these few, none, as far as I am aware, have discussed the question at any length. They have vaguely referred to the subject rather than considered it. Those who believed that the child's head was turned downwards to the os uteri by a kind of somerset in the latter periods of pregnancy, or at the beginning of labour, have, when they mention the subject at all, usually contented themselves by simply attributing its malpositions to some derangement in this supposed mechanism.¹

¹ Thus Roederer, after speaking of the physical gravitation of the head downwards, adds—"Several causes, however, may prevent its descent, or derange its direction. I place in this class defect of the liquor amnii, obliquity of the uterus, tumours in the uterus, premature efforts, and external violence."—*Roederer. L'Art des Accouchemens*, p. 41.

"The cause," observes Ould, "why the feet sometimes present, is certainly from the body being in a more than ordinary erect posture in the womb, at the commencement of labour, whereby the compression of the parts designed for that purpose, thrusts the body forward in a direct line, and consequently the feet against the orifice of the womb."—*Ould. Treatise of Midwifery*. Preface, p. 15.

The following is the only passage in his Memoir in which I find Professor Dubois referring to the probable cause or explanation of the malpositions or malpresentations of the foetus:—"If," he remarks, "the ordinary relations of the foetus to the uterus in the later periods of gestation, are the result of its own efforts, and consequently of a spontaneous determination, this ought to have an internal cause, and internal sensation, which provokes it. What, then

Other authors have mentioned one or more individual causes, as probably capable of producing malpositions of the fœtus, but without attempting any generalisation of the mechanism and operation of these causes.¹

And some of our latest and best systematic authors on midwifery have declared, as their opinion, that all past suggestions on the subject have failed in affording any sufficient explanation of the pheno-

is the nature of this cause,—of this sensation? The abnormal situation of the infant, in which the pelvic extremity corresponds to the small extremity of the ovum, might be uncomfortable or painful even for the fœtus; and the spontaneous movements by which it would change its position, might be classed among those produced by a state of suffering;—or else each of the extremities of the trunk of the fœtus fitting better to the form of the ovum, when the pelvis of the fœtus lies superiorly, and the head inferiorly, might it be the easiness of this position which determines the fœtus to seek it, and return to it.”—*Mémoires de l'Acad. Roy. de Méd.*, tom. ii., p. 284.

¹ For example, in speaking of this subject, Dr Denman observes, “It seems doubtful whether we ought not to exclude accidents as the common causes of these presentations, and search for the real cause in some more intricate circumstances; such as the manner after which the ovum may pass out of the ovarium into the uterus; some peculiarity in the form of the cavity of the uterus, abdomen, or pelvis; in the quantity of the waters of the ovum at some certain time of pregnancy; in the circumvolution of the funis round the haunches or lower part of the back of the child; or perhaps in the insertion of the funis into the abdomen of the child, which is not in all cases confined to one precise part, but admits of considerable variety.”—*Introduction to Midwifery*, p. 467.

“We know little,” remarks Dr Clark, “of the cause of preternatural labour; perhaps it depends upon a peculiarity of form, either in the uterus or pelvis. It is said to arise from accidents; but preternatural births are most likely the effects of peculiarity of shape in the parts.”—*London Practice of Midwifery*, p. 238.

“It is not easy,” says Spence, “to ascertain the cause of the different situations of children in the womb, as in some women it may be owing to too great an inactivity during pregnancy, in others to external violence or over-exertion of strength. Again, the want of a sufficient quantity of the liquor amnii, or the child being entangled by the umbilical cord, may occasion this.”—*System of Midwifery*, p. 220.

“The causes,” observes M. Chailly, “of presentations of the trunk, cannot be very well appreciated. But it is generally supposed that small size and mobility of the fœtus, and obliquity of the womb, may occasion them.”—*Treatise on Midwifery*, p. 443. Transl. of Dr Bedford.

“The smallness and mobility of the fœtus,” M. Cazeaux states, “obliquity of the uterus, and of the passages of the pelvis, deformities of the pelvis, are generally considered as predisposing causes.”—*Traité des Accouchemens*, p. 363.

Some authors, in expressing their opinions on the probable causes of the malpositions of the fœtus, admit one or more of these individual causes, but reject others. Thus, Dr Rigby, when discussing this point, observes—

“The question naturally suggests itself: by what means is the long diameter of the child in so large a majority of cases kept parallel with that of the uterus? This depends in a great measure upon the form and size of the uterus. Where the uterus is not unduly distended with liquor amnii, and where it preserves its natural oval figure, it is scarcely possible that the child should present in any other way than with its cephalic or pelvic extremity foremost. There can be no doubt that the first early contractions of the uterus, in the commencement of labour, have a great effect in regulating the position of the

mena. Thus, in speaking of pelvic presentations, Dr Tucker states, "no satisfactory reason has as yet been given in explanation for their occurrence."¹ When treating of transverse presentations, Dr Churchill, in the same spirit, remarks, "I think all the explanations as yet offered are insufficient."² Dr Ramsbotham conceives that there are not "any evident causes to which we can assign them."³ "To explain why the head of the child does not invariably present in labour is," observes Dr Lee,⁴ "very difficult or impossible."

The present state of obstetric knowledge, then, with regard to the production of malpresentations of the foetus, is confessedly very defective. All the doctrines that have been previously proposed with regard to the causation of the natural position of the foetus have been imperfect in this important respect, that they have failed to afford any clue to the solution of the mode of causation of its occasional preternatural positions. But the new explanation, which I have offered, regarding the production of the normal position of the child, derives additional strength and confirmation from its affording at the same time a perfect rationale of the mode or modes of production of its anormal presentations and positions.

In the observations which I have offered in the preceding section of the present communication, I have attempted to establish the following, among other propositions, relative to the common or natural position of the foetus:—

1. The usual position of the foetus, with the head lowest, and presenting over the os uteri, is not assumed till about the sixth month of intra-uterine life, and becomes more frequent and more certain from that time onwards to the full term of utero-gestation.

2. Both the assumption and maintenance of this position, are vital and not physical acts, for they are found to be dependent on the existence and continuance of vitality in the child; concurring with its life, but being lost by its death.

3. In human physiology we do not know or recognise any vital

child. * * * We may state that the causes of arm or shoulder presentations are of two kinds, viz., where the uterus has been distended by an unusual quantity of liquor amnii, or where, from a faulty condition of the early pains of labour, its form has been altered, and with it, the position of the child. * * * Shortness of the umbilical cord, or its being twisted round the child, insertion of the placenta to one side of the uterus, faulty form or inclination of the pelvis, obliquity of the uterus, as above-mentioned, violent exertions or concussions of the body, plurality of children; of all these we do not believe that there is one which can exert the slightest influence in determining the position of the child."—*Dr Rigby. System of Midwifery*, p. 168.

¹ Principles and Practice of Midwifery (1848), p. 212.

² Theory and Practice of Midwifery, p. 258.

³ Obstetric Medicine and Surgery, p. 333.

⁴ Lectures on Midwifery, p. 327.

power or action, except muscular action, capable of producing motions calculated to alter or regulate the position, either of the whole body, or of any of its parts ; and further, the motory muscular actions of the fœtus are not spontaneous or voluntary, but reflex or excito-motory in their nature, causation, and effects.

4. The position of the fœtus, with the head placed over the os uteri, is that position in which the physical shape of the normal and fully developed fœtus is best adapted to the physical shape of the normal and fully developed cavity of the uterus.

5. This adaptive position of the contained body to the containing cavity is the aggregate result of reflex or excito-motory movements on the part of the fœtus, by which it keeps its cutaneous surface withdrawn as far as possible from the causes of irritation that may act upon it as excitants, or that happen to restrain its freedom of position or motion.

In proceeding to discuss the production of the malpresentations and malpositions of the fœtus, I shall endeavour to show that its preternatural presentations originate in the derangement of one or other of these normal and necessary conditions ; and that they are referable to the following series of causes, viz. : to

First.—Prematurity of the labour ; parturition occurring before the natural position of the fœtus is established.

Secondly.—Death of the child in utero ; or in other words, the loss of the adaptive vital reflex actions of the fœtus.

Thirdly.—Causes altering the normal shape of the fœtus or contained body, or causes altering the normal shape of the uterus or containing body, and thus forcing the fœtus to assume, in its reflex movements, an unusual position in order to adapt itself to the unusual circumstances in which it happens to be placed.

And lastly. — Preternatural presentations are occasionally the result of causes physically displacing either the whole fœtus or its presenting part, during the latter periods of utero-gestation, or at the commencement of labour.

Let us consider in succession and detail the special causes of malpresentation of the fœtus, referable to each of these general heads.

1.—*Prematurity of Parturition.*

We have seen that the common or normal position of the fœtus with the head placed lowest, and presenting over the os uteri, is not in general assumed till the sixth month ; and that from this period onward to the full time, this special position is taken and kept with a certainty and frequency which gradually increase in proportion to the advancement of the pregnancy. The data published in the table given at p. 25, show, in evidence of this law, that, while the percentage of head presentations among children born at the end of

the sixth month is only about 52 in 100, or nearly 1 in 2, this percentage increases to 68 in 100 during the seventh month; to 76 in 100 during the eighth and ninth months; and at last, at the full term of utero-gestation, the proportion of head to other presentations rises as high as 96 or 97 in every 100 births.

It is hence evident that if, from any causes, parturition happens to come on prematurely, the child is much more liable to present preternaturally, than if pregnancy had gone on to the full time; or, in other words, the prematurity of the labour is, in this sense, a cause of the malpresentation of the foetus.

The following table shows the variety of natural and preternatural presentations of the child met with by different observers in various series of cases of premature labour. The returns of Drs Collins,¹ M'Clintock, and Hardy,² refer to the Dublin Hospital, and those of Professor Dubois³ refer to the Maternity Hospital of Paris. The returns of Hoffman,⁴ Hamilton,⁵ and Ramsbotham,⁶ are practically interesting in one respect, namely, that they are the results obtained on the same point in a large number of cases, in which the induction of premature labour had been artificially performed.

Table of the Presentations of the Foetus in 1087 Premature Labours, supervening spontaneously, or induced artificially.

Reporter.	Total Number of Cases.	Number of Head Presentations.	Number of Pelvic Presentations.	Number of Transverse Presentations.
Collins . . .	498	393	102	3
Hardy and } M'Clintock }	108	70	29	9
Dubois . . .	240	147	82	11
Hoffman . . .	120	45	56	19
Hamilton . .	59	54	4	1
Ramsbotham .	62	53	6	3
Total	1087	762	279	46
Proportions among premature labours . . . }		70 in 100	1 in 4	1 in 23
Proportions among common labours at full time . }		96 in 100	1 in 31	1 in 224

The last line in the preceding table, and in several of those tables that follow, gives the relative number of cephalic, pelvic, and trans-

¹ Practical Treatise, p. 461, &c., and Dublin Quarterly Journal for 1836, p. 198.

² On Midwifery and Puerperal Diseases, p. 4.

³ Memoires de l'Academie Royale de Medicine, Tom. ii. p. 287.

⁴ British and Foreign Medico-Chirurgical Review, No. IV. 1848, p. 551.

⁵ Practical Observations in Midwifery, p. 289.

⁶ Obstetric Medicine and Surgery, p. 299.

verse presentations seen among the large series of 84,000 labours reported in the hospital returns of Lachapelle, Boivin, Clarke, and Collins, and which I have already arranged in a tabular form in a previous page (see table, p. 38).—The comparison of the two last lines in the present table shows, 1. That while presentations of the head occur in 96 per cent. in common obstetric practice at the full time, the same presentations occur only in 70 per cent. among premature labours; 2. That pelvic presentations are nearly eight times more frequent among premature labours than among labours at the full time; and 3. That transverse presentations are nearly ten times more frequent among premature labours than among labours at the end of the usual term of pregnancy.

2.—*Death of the Child.*

The child not unfrequently dies in utero, and before labour begins. In cases in which the death of the fœtus is induced from any cause, during its intra-uterine life, the child, when labour at last supervenes, is apt to be found presenting preternaturally. The explanation of this circumstance has been already given in a previous section. The maintenance as well as the assumption of the usual position of the fœtus with the head downwards and over the os uteri, is an excito-motory, and consequently a vital act; and hence, when the vitality of the fœtus is lost, its position, as a result of that vitality, is liable to be lost also. In other words, the death of the child thus becomes a cause of its malpresentation at the time of birth.

Among the Dublin hospital returns published by Drs Collins, Hardy and M'Clintock, the presentations are noted in 669 cases in which the child was expelled in a "*putrid*" state, and where, consequently, it may be justly assumed that death had occurred sometime before the supervention of labour. The following table shows the relative number of different presentations among these 669 putrid children.

Table of the Presentations of the Fœtus in 669 Cases in which the Child had died in Utero.

Reporter.	Total Number of Cases.	Number of Head Presentations.	Number of Pelvic Presentations.	Number of Transverse Presentations.
Collins	527	438	83	6
Hardy and } M'Clintock }	142	115	21	6
Total	669	553	104	12
Proportions among putrid } children }		82 in 100	1 in 6	1 in 55
Proportions among common } labours at full time . }		96 in 100	1 in 31	1 in 224

As far, then, as these data go, the difference between the liability to cephalic, pelvic, and transverse presentations between children who have died before labour, and those born alive, may be expressed as follows:—1. Head presentations are 16 per cent. less frequent among dead than among living infants; 2. Pelvic presentations are five times more frequent among dead than among living children; and 3. Transverse presentations are four times more frequent among the former than the latter.

Under the first of the preceding heads we have traced the malpresentation of the fœtus to the occurrence of labour before the reflex movement of the fœtus had sufficiently fixed and established its normal position with the head lowest. Under the second head we have seen the absence or loss of the fœtal reflex movements from the intra-uterine death of the child, leading to the same result. We have now to speak of a series of other causes leading to preternatural presentations, by directly changing the relative forms, either of the fœtus or of the uterine cavity, and thus indirectly forcing the contained fœtus to place itself, by its reflex motions, within the containing uterine cavity in some anormal position, in order, so far, to adapt itself to its normal circumstances, that it may avoid and avert, as much as possible, the irritation of those external excitants, that we have seen capable of acting upon its cutaneous surface and excito-motory system. Under this third head, and as referable to it, we shall consider the influence, in the production of preternatural presentations, of diseases of the fœtus, its states of malformation and monstrosity, the existence of twins, of hydramnios, of spasmodic contractions, and organic disease in the uterine parietes, of placenta-prævia, of deformity of the pelvis, and of original anomalous configuration of the uterus.

3.—*Intra-uterine Diseases of the Fœtus altering its form.*

Various affections of the fœtus in utero terminate in alteration to a greater or less degree of the form and shape of the infant. Ascites, for instance, spina bifida, hydrocephalus (Plate III., Fig. 2) &c., have this effect. Of these intra-uterine diseases the most common is hydrocephalus; and, taking it as the most frequent and noted pathological example, I shall limit to it the proofs that I adduce of the effects of diseases altering the form of the fœtus, having the effect of altering also its position or presentation.

Among sixty-nine cases of intra-uterine hydrocephalus, previously referred to as collated by Dr Thomas Keith,¹ in fifty-nine the cephalic, and in ten the pelvic extremity of the infant presented. One of the sixty-nine cases was a transverse representation.

¹ Thesis on Congenital Hydrocephalus, as a cause of Difficulty and Danger in Parturition. Edinburgh, 1848.

Table of Proportions of different Presentations of the Fœtus in sixty-nine cases of Intra-uterine Hydrocephalus, and in 84,000 Cases of Common Labour.

Conditions.	No. of Head Presentations.	No. of Pelvic Presentations.	No. of Transverse Presentations.
Hydrocephalus Cases,	59 in 69	1 in 7	1 in 69
Common Cases, . . .	96 in 100	1 in 31	1 in 224

Other diseases of the fœtus and its appendages may perhaps act as causes of its malpresentation—such as inflammatory adhesions of the surface of the fœtus to the surface of the amnion; morbid adhesions and fixation of the umbilical cord upon the body or limbs of the fœtus, &c.; but I am not aware of any recorded series of facts sufficient to prove or disprove this supposition. If such causes act in producing malpresentations, they will probably be found to lead to this effect, by restraining, within fixed limits, the adaptive reflex movements of the fœtus, and by thus preventing these movements from placing the fœtus in its usual position within the uterine cavity.

4.—*Malformations and Monstrosities altering the Form of the Fœtus.*

In the recorded histories of cases of malformation of the fœtus, the details of the birth and presentation of the child are very rarely given. The teratological and anatomical facts connected with such malformed infants, have hitherto principally engaged the attention of medical men, and their obstetric history has been almost entirely neglected. But the data that we do possess, prove sufficiently, in relation to such malformations and monstrosities, that the resulting alteration which they produce in the shape of the fœtus, is, as we would *a priori* expect, a frequent cause of their preternatural presentation in utero and at the time of birth.

In cases of abdominal and thoracic eventration of the fœtus (the “*Monstres Cesolomiens*,” in the classification of St Hilaire), the malformed infant usually presents, according to Klein, not by the head, but by the abdomen, the mass of the displaced viscera lying in front.¹

From Fried, Harhold, and Klein, Burdach cites cases of imperfect development of the lower extremities in which the fœtus presented, not by the head, but by the malformed parts.²

In his work on Teratology, Isidore St Hilaire states it as a general and remarkable fact (*fait remarquable*), “that the presentation by the head is much less common among fœtuses affected with

¹ Deutsches Archiv für Physiologie, tom. iii. (1817) p. 39, &c.

² Traité de Physiologie, vol. iv., p. 223.

monstrosities and malformations, than among normal fœtuses. I have (he adds) collected cases, published and unpublished, in sufficient number, to leave no doubt in relation to the truth of this result; but I only add, with dubiety, and as an opinion requiring the confirmation of future observers, that the part which most frequently, and as it were by preference, presents, is the region affected with the malformation."¹

An immense number of cases of double monstrosity have been placed upon record; but the presentations of the children at birth, are stated in very few instances. The following table contains the results of the presentation in fifteen such cases, including, in fact, all which a cursory examination into this point in teratology has enabled me to ascertain.

Table of the Presentations in Fifteen Cases of Double Monstrosity.

Reporter.	Nature of Presentation.	Reference.
Huron . . .	Feet.	Monthly Journal of Med. Sc. 1847-48, p. 67.
Derien . . .	Feet.	Gazette Médicale de Paris, No. 23. 1848.
Bromilon . .	Head.	Edinburgh Med. & Surg. Journal, vol. lv. p. 435.
Lyell . . .	Feet.	Monthly Journal of Med. Sc. August. 1848.
Moreau . . .	Feet.	Traité des Accouch. tom. ii. p. 309.
Duverney . .	Feet.	Mémoires de l'Acad. Roy. de Médic. tom. i. p. 357.
Peu . . .	Head.	Do. do. do. p. 358.
Evrat . . .	Head.	Do. do. do. do.
Brez d'Angers	Feet.	Do. do. do. p. 359.
Regnoli . . .	Feet.	Do. do. do. do.
Ratel . . .	Head.	Do. do. do. p. 360.
Molas . . .	Head.	Do. do. do. p. 363.
St Hilaire . .	Feet.	Des Anomalies, &c. &c. tom. iii. p. 114.
Letouze . . .	Head.	Archives Générales de Médecine. Dec. 1848.
Askham . . .	Feet.	Lancet, vol. ii. 1848, p. 235.

It may be observed that out of these fifteen cases, the presentation was footling in nine, and cephalic in six. The instances of footling presentation were consequently extremely prevalent, and in fact preponderated over the other. In none did the arm present.

5.—Twins.

When two or more children are contained simultaneously within the uterine cavity, the form of the individual cavity or loculament occupied by each child, varies more or less from the regular ovoid form of the expanded uterus. The cavities which contain the fœtuses in multiparous pregnancy are more or less relatively different in shape from the cavity which contains the fœtus in uniparous pregnancy. A glance at the sketch of the form and contents of the

¹ Histoire des Anomalies, &c., vol. iii., p. 570.

uterus in plural pregnancy, given by Smellie, and copied in Plate III. (Fig. 1) sufficiently confirms this remark. And as the reflex irritations and movements of the fœtus force it to adapt itself to the form of the cavity containing it, malpositions and malpresentations among twin children are more common than among single births. The following table in proof of this statement is constructed from the returns of presentations among twin children, as observed in the Dublin¹ and Edinburgh² Lying-in hospitals, and among the patients of the London Maternity Charity.³

Table of the Presentations of the Fœtus in 808 Labours with Twin Children.

Report.	Total Number of Cases.	Number of Head Presentations.	Number of Pelvic Presentations.	Number of Transverse Presentations.
Clarke	126	73	53	...
Collins	449	309	133	7
Hardy and } M'Clintock }	190	122	62	6
Ramsbotham .	772	532	221	19
Simpson	30	23	7	...
Reid	48	25	22	1
Total	1615	1084	498	33
Proportions among twin } children }		67 in 100	1 in 3	1 in 49
Proportions among all births .		96 in 100	1 in 31	1 in 224

In pregnancies with triplets, as with twins, there is the same tendency to malpresentations of the child, and from the same cause. Amongst eighteen children born in cases of triplet pregnancy, and detailed in the reports referred to in the foot-note,⁴ the following form the modes in which the children presented at birth. Of the eighteen children, thirteen presented by the head, or seventy per cent.; four children presented by the pelvis, and one among the eighteen was a transverse presentation.

6.—*Hydramnios, or Excess of Liquor Amnii.*

Before the sixth month, the quantity of liquor amnii is very much greater, in relation to the size of the fœtus, than at the full time. In

¹ Clarke. Transact. King's and Queen's Coll. of Physic., Ireland. Vol. i, p. 403. Collins. Practical Treatise, p. 314. Hardy and M'Clintock's Report, p. 329.

² Monthly Journal of Medical Science, 1848, p. 335.

³ Ramsbotham's Obstetric Medicine and Surgery, p. 495. Reid, in London Medical Gazette, Nov. 1835.

⁴ Collins. Practical Treatise, p. 340; Hardy and M'Clintock's Report, p. 330; Simpson in Monthly Journal of Medical Science, 1848, p. 339; Davies. Ibid, 1841, p. 448.

fact the quantity surrounding the foetus is up to that period relatively so large, and the uterine cavity so distended with it, that the foetus can move about in it readily and rapidly. (See Plate II, fig. 4.) This perfect freedom from large room is, as we have already seen, the principal reason why the foetus does not require to assume any specific position before that time. But when the liquor amnii remains in great quantity up to the full time, or when the foetus remains small, the permanence of these earlier and temporary conditions produces anormally at the full time the same result which they normally produced at the fifth and sixth months,—the presentation, namely, is often preternatural.

I have no statistical proofs to offer in evidence of this statement, as no collection of cases of hydramnios at the full time, and of its effects upon the presentation, has, as far as I know, been yet made by any author. But the fact itself that malpresentations are often found co-existing with a preternatural collection of liquor amnii, is admitted by most obstetric writers. “The passive motions of the foetus (observes a late German author)¹ are easily performed when there is an excess of liquor amnii, and we not unfrequently find with it circumvolutions of the cord around the child, and preternatural positions of the foetus.”

7.—*Spasmodic Contraction in the Uterine Parietes.*

In the latter months of utero-gestation, patients often feel and suffer from spasmodic contractions in the uterine parietes. When these spasmodic contractions are severe, limited to particular portions of the uterine walls, and more permanent than usual, they sometimes so alter the normal form of the uterine cavity as to force the foetus to assume a new and anormal position. “It is (says Dr Rigby²) a well-known fact that cross-births, as they have been called, are frequently preceded by severe spasmodic pains in the abdomen, from which the patient suffers for some days or even weeks before labour has commenced; the uterus is more or less the seat of these attacks, which usually come on toward night-time; and, in some instances, it is felt for the time hard and uneven from irregular contraction. It was the circumstance of this symptom having preceded five successive labours of a patient, in all of which the child had presented with the arm or shoulder, which induced Professor Nægele, when attending her in her sixth pregnancy, to endeavour to allay these cramp-like pains, which had begun to show themselves as severely as on former occasions. Having tried opium by itself, and also in combination with ipecacuanha or valerian without effect, he ordered her a starch injection with twelve drops of tinct. opii every night, as long as she continued to suffer from these attacks; the spasms soon ceased, nor did they appear again during the remainder of the preg-

¹ Busch and Moser's *Handbuch der Geburtskunde*, vol. iii. p. 361. See also the works of Wigand, Carus, Rigby, &c.

² *System of Midwifery*, p. 169.

nancy, and he had the satisfaction of delivering her at the proper time of a living child, which presented in the natural manner."

8.—*Organic Diseases of the Uterine Parietes, &c.*

By far the most common form of morbid growth in the parietes of the body and fundus of the uterus, is the common and well-known fibrous or fleshy tumour. Pregnancy not unfrequently occurs when the uterine walls are the seat of this diseased structure. Fibrous tumours of the uterus are seldom found in connection with pregnancy so large in size, or so placed towards the internal surface of the uterus, as to alter its cavity from its normal form and make the foetus assume a preternatural position. But occasionally pregnancy does take place even when the tumour encroaches much upon the uterine cavity; and the resulting form of that cavity may be such as to cause a preternatural presentation. In one case, where a large fibrous tumour existed at the fundus uteri, I found the breech of the infant form the presenting part in labour. Preternatural presentations of the infant in connection with large fibrous tumours in the uterine parietes have been recorded by Dr Beatty,¹ Dr Ashwell,² &c. But I am not acquainted with any series of data sufficient to show the degree of liability to preternatural presentations resulting from the presence of fibrous tumours, or such other organic diseases in the uterine parietes, or in the ovaries or neighbouring viscera, as may have the effect of altering the shape of the uterine cavity during pregnancy. This defect, however, is capable of being so far supplied by appealing to the next two causes which I have to enumerate, viz., placenta prævia, and great deformity of the brim of the pelvis. Under both these circumstances, the normal form of the uterus is altered by preternatural organic conditions existing in the one (placenta prævia) within the interior of the uterus, and in the other (deformity of the brim) existing without the uterus,—but both leading to the same result of a liability to preternatural presentation by the same cause, viz., a change in the physical shape of the uterine cavity.

9.—*Placenta Prævia.*

The lower end of the ovoid cavity of the uterus at the full term of pregnancy is principally formed after the sixth month, and from the development of the cervix uteri. In placental presentations this lower or narrow end of the uterine ovoid does not acquire its normal size and form in consequence of the implantation of the placental mass upon its interior. Hence, in these cases, the whole normal ovoid figure of the cavity of the uterus is altered in shape, and in adapting through its reflex movements its form to the altered form of the uterus, the foetus is liable to assume and maintain a preternatural position.

¹ Dublin Journal of Medical Science, vol. xvii., p. 414.

² Treatise on Diseases of Women, p. 338.

The data in the following table afford ample evidence of the great frequency of preternatural presentations of the foetus in cases of implantation of the placenta over the os and cervix uteri, a fact scarcely, if indeed at all, alluded to by obstetric writers. The data are derived, 1. From the published reports of Madame Lachapelle, and Dr Collins, the only two authors who seem to have stated the presentations of the foetus in *all* the cases of placenta prævia which they record; and, 2. From a long series of unpublished cases of placenta prævia in the practices of Dr Wilson of Glasgow, and of Dr John and Dr Francis H. Ramsbotham of London, with the manuscript notes of which I have been very kindly favoured.

Table of the Presentations of the Foetus, in 366 Cases of Placenta Prævia.

Reporter.	Total No. of Cases.	No. of Head Presentations.	No. of Pelvic Presentations.	Number of Transverse Presentations.
Lachapelle, . . .	17	14	2	1
Collins,	12	8	3	1
Wilson,	29	25	4	...
J. Ramsbotham, .	124	108	11	5
F. H. Ramsbotham,	184	155	19	10
Total	366	310	39	17
Proportions in cases of Placenta } Prævia }		85 in 100	1 in 9	1 in 21
Proportions among common la- } bours at full time, . . . }		96 in 100	1 in 31	1 in 224

The comparison of the two last lines in the present table, shows, 1. That, while presentations of the head occur in 96 per cent. in common obstetric practice at the full time, the same presentations occur in only 85 per cent. among cases complicated with placental presentation; 2. That pelvic presentations are more than thrice as frequent among cases of placenta prævia as among ordinary labours at the full time; and 3. That transverse presentations are ten times more frequent in cases of placental presentation than among ordinary labours at the full term of pregnancy.

10.—*Distortion and Contraction of the Brim of the Pelvis.*

Few obstetric authors have adverted to pelvic contraction and distortion, as a cause of preternatural presentations. Yet its occasional operation is certain.

"Mr Barlow,"¹ observes Dr Ramsbotham,² "states that he is induced to believe preternatural presentations are far more frequently met with under distortion of the pelvis, than when that organ is well-

¹ Essays on Surgery and Midwifery, p. 348.
Obstetric Medicine and Surgery, p. 299.

formed. This remark (Dr Ramsbotham continues) coincides with my own observation ;” and in another part of his work,¹ he further remarks, “ Transverse presentations are by no means comparatively more frequent among the poor than those in affluent circumstances ; but some women seem to be naturally predisposed to this irregularity. Thus, a patient whom I attended in all her labours, out of five children which she has borne, has been the subject of four transverse presentations ; her pelvis is slightly distorted at the brim. And another woman, now dead, who always, under pregnancy, became a patient of the Royal Maternity Charity, in twelve labours suffered seven shoulder presentations. I delivered her myself five times under these difficulties, and my father twice. This person also possessed a contracted pelvis.”

When the pelvic contraction is great, and involving the brim, and hence interferes much with the development and shape of the lower end of the uterus, its influence in leading to preternatural presentations of the fœtus is well marked, and capable of statistical proof. The operation which requires to be had recourse to when the pelvis is thus very highly deformed, is the Cæsarean section. In most of the cases in which this operation is recorded to have been practised, the presentation of the fœtus is not mentioned, and in 44 instances only have I been able to find, on a casual examination, any adequate data relative to the presentation of the child. References to these 44 cases are given in the accompanying foot-note.² Among the 44 infants, 30 presented by the head, or about 68 per cent. ; 8 of the children, or nearly one in every 5, were pelvic presentations ; and 9, or one in about every 7, presented trans-

¹ *Obstetric Medicine and Surgery*, p. 334.

² The following are references to the cases in which the head is mentioned as presenting :—Smellie's *Midwifery*, vol. iii., p. 423 ; MMS. *Lectures of Professor Young* ; First letter of Dr Hull of Manchester, three cases ; Hull's *Translation of Baudelocque's Essay on Cæsarean Section*, three cases ; *Edinburgh Medical and Surgical Journal*, vol. xxiv., p. 296, also p. 304 ; vol. xxx., p. 53 ; vol. xxxi., p. 443 ; *Medico-Chirurgical Transactions*, vol. ix., p. 13 ; *British and Foreign Medical Review*, vol. x., p. 572 ; vol. xi., p. 531 ; vol. xiii., p. 545 ; *Lancet*, June 1840 ; *Northern Journal of Medicine*, vol. iii., p. 247 ; *Meigs' Obstetrics*, p. 531 ; *American Journal of Medical Science*, vol. i., p. 269, two cases ; vol. xii., p. 386 ; *Monthly Journal of Medical Science*, 1841, p. 218 ; 1842, p. 425 ; 1843, p. 160 ; 1844, p. 358 ; 1845, p. 323, p. 887 ; 1846, p. 309 ; 1847, p. 130. In the succeeding cases, some part of the pelvic extremities is mentioned as presenting :—Hull's *Translation of Baudelocque's Essay*, two cases ; *Medico-Chirurgical Transactions*, vol. vii., p. 264 ; *Edinburgh Medical and Surgical Journal*, vol. viii., p. 11 ; vol. xvii., p. 106 ; *British and Foreign Medical Review*, vol. ii., p. 271, and a second time in the same case ; *American Journal of Medical Science*, No. xxxii. 1835, p. 546 ; *Monthly Journal of Medical Science*, 1843, p. 835. The following are references to cases in which some part of the superior extremities of the infant is stated to have presented :—Hull's *Translation of Baudelocque's Essay*, four different cases ; and *Edinburgh Medical and Surgical Journal*, vol. xxii. p. 248.

versely. Or we may state these results as contrasted with the presentations in cases of common labour in a tabular form, as follows :—

Table of Proportions of Different Presentations of the Fœtus in 44 Cases of Cæsarean Section, and in 84,000 Cases of Common Labour.

Conditions.	Proportion of Head Presentations.	Proportion of Pelvic Presentations.	Proportion of Transverse Presentations.
In Cæsarean Sections,	68 in 100	1 in 5	1 in 9
In Common Labours,	96 in 100	1 in 31	1 in 224

In speaking of pelvic contraction as a cause of malposition of the infant, Dr Ramsbotham seems to doubt whether it be possible to explain in what manner such a cause could lead to the effect which he attributes to it. “*How* (he observes) a contraction of the pelvic brim can influence the position of the fœtus in utero, it is difficult to explain or even to imagine.”¹ But the solution of this apparent difficulty is sufficiently easy upon the principles which I have endeavoured to state in the present essay. A contracted brim, more especially when that contraction is great, directly interferes with the expansion of the lower part of the uterus, forces the uterus, in this way, into a preternatural form, and forces the fœtus to place itself by its reflex actions in preternatural positions, in order to lie adapted to that form. When the pelvis is much deformed by mollities ossium, or rickets, as in cases requiring Cæsarean section, other additional circumstances aid in leading to still greater alterations in the form of the uterus. The trunk is generally also deformed, the ribs approached towards the pelvis, and the abdominal cavity diminished in depth. During its development, the expanding uterus is not only prevented from developing itself downwards, but it is also prevented from developing itself to its usual extent upwards. It grows and expands forwards and laterally, or, in other words, in the directions in which there is least resistance to its increase in volume. Under these restraints and conditions it expands more laterally and antero-posteriorly, and less in the longitudinal direction, than is natural. It tends to assume such a form as is represented in Plate III. (Fig. 3.) This globular form, simulating the globular form of the uterus at the fifth month, is perhaps the cause why transverse presentations are so peculiarly common in instances in which the brim of the pelvis is so much deformed as to require Cæsarean section.

11.—*Irregularity in the Configuration of the Uterus.*

Like every other organ of the body, the uterus occasionally shows, in particular individuals, deviations to a greater or less extent from

¹ Obstetric Medicine and Surgery, p. 229.

its normal standard form. Some of its more marked deviations in shape and development interfere so much with its functional activity as to be a cause of sterility. Other changes found in its configuration do not necessarily prevent conception, but when pregnancy occurs along with them, the mis-shaped uterus, during its growth, continues sometimes to remain so far altered in form and shape from the natural ovoid figure of the expanded organ, that the adaptive reflex movements of the fœtus necessarily place it, in such a cavity, under a preternatural position. Jahn,¹ Meissner,² Meckel,³ and others,⁴ have described and collected many cases in which the uterus showed various anomalies in form and configuration under different original deviations of form or development. But without entering into an account of these individual anomalies and their effects, I will content myself with illustrating, by a single case, the mode of action of the cause in question, in the production of malpresentations:—

A patient in her two first labours had the arm of the child presenting. In her third labour the same presentation recurred. On examining the uterus before delivery, Dr Lecluyse found it of an anormal configuration. It was short and depressed in its vertical direction, but large and expanded towards either side. It was ellipsoid instead of pyriform in shape; and had thus gained in lateral width what it had lost in perpendicular height. Its long axis was from side to side; and in placing itself under its reflex movements, so as to adapt the long axis of its ovoid mass to the long axis of the uterus, the fœtus, of necessity, was placed and presented transversely. After the uterus was emptied in this case, the organ still presented the same deformity of shape.⁵

The preceding case refers to an original deviation in shape in a single uterus. In cases of duplicity of the uterus impregnation sometimes takes place. The pregnant side or horn occasionally presents, when distended, such a degree of irregularity of shape, as to force the fœtus into some corresponding irregularity in position. Geiss reports a case of duplicity of the uterus, where the presentation of the fœtus was transverse.⁶ In describing such cases, most authors have omitted to state the nature of the presentation.

¹ Schlegel's *Sylog. operum ad Artem Obst.*, vol. i., p. 257.

² *Frauenzimmerkrankheiten*, Band, i., p. 535, *et seq.*

³ *Pathologischen Anatomie*, Band, i., p. 673.

⁴ Voigtel's *Handbuch der Pathol. Anatomie*, vol. iii., p. 1-455, &c. Colombat's *Traité des Maladies des Femmes*, vol. i., p. 200. See also the writings of Hunter, Rokitansky, Tiedemann, Cassan, Moreau, &c.

⁵ *Annales de la Société d'Anvers*, 1845, p. 89. *London Medical Gazette*, vol. xxxv., p. 847. In Plate III., Fig. 4, I have copied from Chailly the figure which he gives of the shape of the uterus under a pelvic presentation. An uterus of such a configuration (with the ovoid reversed—the largest extremity lowest) would, according to the principles laid down in the text, lead to the pelvic instead of the cephalic position of the fœtus.

⁶ *Rust's Magazin für die gesammte Heilkunde*, vol. xx. (1825) p. 8.

Perhaps under the present head of causes I should notice the supposed effects of obliquities and flexions of the uterus in the production of malpresentations. These obliquities and flexions, however, when they exist before pregnancy, generally become spontaneously rectified as utero-gestation advances; and do not thus ultimately interfere with the shape of the uterine cavity, or, through its shape, with the position of the child. But in those rarer cases where the configuration of the uterine cavity remains altered by their influence, particularly in its lower or cervical part, this altered configuration of the containing organ may occasionally affect the corresponding position and mode of presentation of the contained fœtus.

12.—*Mechanical and Casual Displacements of the Fœtus.*

Some authors have considered accidental displacements of the fœtus from falls, carriage exercise, strong emotions, &c., as one of the principal causes of its malpresentations, whilst others have doubted or denied the possible influence of their operation.

Up to the sixth or seventh month of pregnancy the fœtus is in general relatively so small, and the surrounding quantity of liquor amnii so abundant, that the child may be readily displaced from the position which it happens at the time to occupy, by any violent movements or succussions on the part of the mother. When the fœtus enlarges more, and ultimately requires, in consequence of its increased length, to place its long axis parallel with the long axis of the uterus—the possibility of its being accidentally turned completely round in the uterine cavity, is prevented by the physical fact of the long axis of its head and body being longer than the width or short axis of the cavity, in which it would make this supposed evolution. The usual length of the fœtal ovoid at the full time is about twelve inches, and the usual lateral width of the uterus about eight or nine inches, so that the former could not readily turn within the latter. But when the fœtus is smaller, the quantity of liquor amnii considerable, and the shock given to the maternal trunk in any degree great, a complete displacement of the fœtus may no doubt occur, so as to change, for example, a cephalic into a pelvic presentation; and the return from the pelvic to the primitive cephalic position is subsequently prevented by the same physical relations as guarded against its original occurrence. My friend, Mr Cockburn, informs me that a patient of his, the mother of eight children, had seven of the children presenting naturally, and one by the pelvis or feet. When well advanced in pregnancy with the child that ultimately presented preternaturally, she happened to be thrown down with a severe fall upon her back. To Mr Cockburn she declared immediately afterwards her own conviction, that she felt the child turn round at the time of the accident, and that it would be born in a wrong position; as ultimately proved to be the case.

The presenting head of the fœtus sometimes happens to become

mechanically displaced at the commencement of labour, and a primary normal presentation becomes thus changed into a secondary preternatural presentation. This has been principally observed to happen when there was some obstruction at the brim of the pelvis, either in the bones or soft parts; the head when driven obliquely against this obstruction by the first uterine contractions, has slipped aside, and the neck, or rather shoulder, come to present over the os uteri. Denman,¹ Merriman,² Burns,³ &c., have described and directed attention to cases of secondary malpresentation of this kind. Where the quantity of liquor amnii at the time of labour continues great, and the child is small and mobile, it may occasionally, though rarely, at the full time, become repeatedly displaced in different ways under the pressure of the contracting uterus, and the reaction of the opposing maternal structures. Baudelocque relates a case in which "during a labour of thirty-six hours, the child presented successively, and several times over, the head, the feet, the back, the shoulder, or one of its sides; and, at the instant the membranes burst, the belly, the knees, and a loop of the cord."⁴

The various minor modifications of the position of the head and pelvis met with at the commencement of labour, are, for the most part, owing to slight mechanical changes produced in the commencement of labour by the compressions of the uterus upon the presenting parts, during the first pains, and the reaction of the maternal parts upon those parts of the child.

SECTION V.—RELATIVE INFLUENCE OF THE SPECIFIED CAUSES IN THE PRODUCTION OF THE DIFFERENT GENERA OF PRETERNATURAL PRESENTATIONS.

There is considerable variety traceable in the power and frequency with which the different causes of preternatural presentations that I have described act in producing these different presentations. They not only produce malpresentations, with different degrees of certainty, but some produce one form of malpresentation more readily

¹ "Having been called to women in the beginning of labour, and finding, by an examination, that the head of the child presented, I have left them for several hours, till the first changes were naturally made. When I have examined them on my return, I have found the arm of the child presenting, the head being departed out of my reach."—*Denman's Introduction*, p. 495.

² *Medico-Chirurgical Transaction*, Vol. x., p. 62.—In a case of tumour of the soft parts obstructing delivery, the head, after presenting during a labour which was allowed to last for three days, was removed under the action of the pains, and the right shoulder came to present.

³ "It is a fact well ascertained, that although the head may be felt distinctly in the commencement of labour, yet when the membranes break it may be exchanged for the shoulder or some other part. I have been informed of a case where the shoulder was exchanged for the head, and Joerg seems to have met with the same circumstance."—*Burns' Principles of Midwifery*, 9th Edition, p. 411.

⁴ *System of Midwifery*. Heath's Translation, Vol. i., p. 264.

than another. The comparative effects in this respect of certain of the causes which I have enumerated cannot be ascertained, because we have no statistics of the results to guide us. In reference to others, I have adduced statistical information sufficient to enable us to calculate imperfectly, and in a general way, their relative effects. The following table shows the comparative frequency with which six of the causes of preternatural presentation, which I have above considered, respectively led to the occurrence of preternatural presentations of the foetus :—

Table of Proportion of Preternatural Presentations under Six specified Causes.

Conditions.	No. of Cases.	No. of Malpresentations.	Proportion of Malpresentations.
Premature labour .	1087	325	1 in 3
Cæsarean section .	44	14	1 in 3
Twin pregnancy .	1615	531	1 in 5
Death of the child .	669	116	1 in 6
Hydrocephalus . .	69	11	1 in 6
Placenta prævia . .	366	56	1 in 7
Common practice .	84,684	3128	1 in 27

But the causes producing preternatural presentations do not always produce the different forms of these malpresentations in the same relative proportion. Some causes predispose more to pelvic than to transverse presentations, and others the reverse. The following table gives the relative frequency of pelvic presentations, under the influence of the six causes enumerated :—

Table of Proportion of Pelvic Presentations under Six specified Causes.

Conditions.	No. of Cases.	No. of Pelvic Presentations.	Proportion of Pelvic Presentations.
Premature labour .	1087	279	1 in 4
Cæsarean section .	44	9	1 in 5
Twin pregnancy . .	1615	498	1 in 3
Death of the child .	669	104	1 in 6
Hydrocephalus . .	69	10	1 in 7
Placenta prævia . .	366	39	1 in 9
Common practice .	84,684	2750	1 in 31

It will be observed, that the order of relative frequency of pelvic presentations under these six specified causes, differs from the order of relative frequency of preternatural presentations in general under the same causes, and as given in the table immediately pre-

ceding. The order of relative frequency of transverse presentations from the same six causes, is very different from either of the above, as the facts in the following table will prove :—

Table of Proportion of Transverse Presentations under Six specified Causes.

Conditions.	No. of Cases.	No. of Transverse Presentations.	Proportion of Transverse Presentations.
Premature labour .	1087	46	1 in 23
Cæsarean section .	44	5	1 in 9
Twin pregnancy .	1615	33	1 in 49
Death of the child .	669	12	1 in 55
Hydrocephalus .	69	1	1 in 69
Placenta prævia .	366	17	1 in 21
Common practice .	84,684	378	1 in 224

The preceding tables demonstrate, that some of the causes which are liable to lead to preternatural presentations, are more liable to produce pelvic than transverse presentations; or the contrary. And if we venture to inquire into the grounds of this difference of effect, we will find it existing, I believe, in the peculiarities of form, and, consequently, of adaptation, which the causes in question produce, either upon the containing uterus or the contained fœtus. For example, let the cause producing the malpresentation be liable to change the form of the uterus, so that this organ be anormally increased in width, or in lateral or anterior development,—and the result will be a tendency to the frequent occurrence of transverse presentations of the fœtus; for the long axis of the ovoid mass of the fœtus becomes placed transversely in order to be adapted to the misshapen uterus, the long axis of which in these supposed conditions, is more lateral or transverse than vertical. We have often this form of the uterus in Cæsarean section, for reasons that I have already mentioned under that head (see also plate III. fig. 3); and in placenta prævia, where the placental mass fills up more or less the cavity of the cervix, and prevents its full development. Under the action of both these causes, the preceding table shows that transverse presentations are especially common. Again, in hydrocephalus of the fœtus, transverse presentations are rare, but pelvic presentations common; because the irregularity of form in the contained body is such, that the child may be adapted to the containing uterus, far more readily in a pelvic than in a transverse position.

SECTION VI.—ON THE RECURRENCE OF MALPRESENTATIONS IN SUCCESSIVE PREGNANCIES IN THE SAME MOTHER; AND ITS CAUSATION.

Various authors mention the aptitude to the recurrence of preternatural presentation in different pregnancies in the same mother; and the fact is one well known and established in obstetric pathology.¹

Sometime ago I delivered by turning, for presentation of the arm and cord, a patient of Mr Cunningham. It was the sixth child, and the only one born alive. With one exception the presentations in her five previous labours had been all preternatural, and most of them accompanied with prolapsus of the cord. Dr Collins² mentions an instance in which as many as nine preternatural presentations occurred in the same mother.

Occasionally the presentation in the same mother though always preternatural, is not always the same presentation. For example, Dr Lee³ mentions a woman with distorted pelvis, in whom the inferior extremities presented in the first and second labours, and an arm in the fourth; and another who had eight preternatural labours in succession, the arm presenting in the first four or five, and the nates or inferior extremities in all the others. In other instances there is a regular recurrence of exactly the same type of preternatural presentation in several successive labours. A case is recorded by Walther⁴ in which the shoulder presented in six successive pregnancies, in consequence of a malformation of the uterus. Madame Renard⁵ has recently published an instance, in which a patient had the right shoulder presenting in five successive labours; the pelvis was deformed.—Even more rare forms of complex preternatural presentation sometimes recur regularly in different labours in the same patient. Dr Hamilton was in the habit of mentioning, in his lectures, a case in which presentation of the breech and one foot occurred in six or seven successive labours in a patient of Mr Moir.

The recurrence of the same, or different malpresentations in successive pregnancies in the same mother, has generally been looked upon as a problem more difficult to explain and solve, than the

¹ " Though preternatural presentations (says Denman) seldom occur when they are dreaded and expected, it is remarkable that some women are peculiarly subject to them; not once only, which might be considered the effect of some accident, but exactly to the same presentation, whether of the superior or inferior extremities, in several successive or alternate labours."—*Introduction to the Practice of Midwifery*, p. 467. See also the works of Ramsbotham, Burns, Meigs, &c.

² *Practical Treatise*, p. 40.

³ *Lectures on Midwifery*, p. 327.

⁴ *Journal de Chirurgie*, tom. iii. p. 59.

⁵ *Gazette des Hôpitaux*, Avril 1849.

more simple fact of the occasional occurrence of a preternatural presentation of the fœtus. And some authors seem to consider the phenomena as almost beyond the reach of explanation. "I feel wholly unable" (observes Dr Lee¹) "to explain the cause of preternatural presentation occurring repeatedly in the same individuals, as described by Dr Denman and other systematic authors." "It is" (he elsewhere observes²) "very difficult, or impossible, to explain why the head of the child does not invariably present in labour, or assign a cause for the same woman having preternatural presentations in several successive labours, the head of the child being rarely, if ever, in them the presenting part."

The doctrine of the causation of the positions and presentations of the fœtus, which I have attempted to develope in the present memoir, affords a simple key to this obstetric enigma.

Some of the causes producing malpresentation, in the way described, are occasional or accidental only; and are not liable to recur in other pregnancies in the same mother. Hence, under the action of these causes, a malpresentation of the fœtus will occur in one or two labours only in the same patient, and not in all. To this set of instances belong the presence of twins; death, or disease, and malformation of the fœtus; prematurity in the labour; mechanical accidental displacements of the fœtus; and changes in the configuration and form of the uterus from spasms in its parietes, from the cervical or other anormal implantation of the placenta, and perhaps from other conditions which I have not taken time to trace out in the preceding observations, as fœcal accumulations in the colon, compression of the abdomen, and other such causes as may produce unequal pressure on the external surface of the uterus, and thus change the shape of its internal cavity,—causes, some of which are capable of being prevented and treated, and their effects on the presentation of the child thus averted. But other causes of malpresentation of the fœtus are not occasional and accidental, but permanent and constant. They are not limited to one pregnancy, but present in all. They are anatomical conditions, either existing throughout the whole life of the mother, or recurring with each successive labour. For example, the lower part of the ovoid cavity of the uterus may be altered from the normal configuration and shape in each successive pregnancy, by deformity of the brim of the maternal pelvis,—the deformed brim preventing its full development, forcing it always to assume a particular type and form, and this type being one which obliges the fœtus to assume some special or preternatural position, in order to adopt and accommodate itself to the existing special and preternatural form of the uterine cavity. I have already cited from Dr Ramsbotham, Renard, &c., cases of deformity of the brim of the pelvis, leading in this way to a succession of preternatural presentations of the child

¹ Clinical Midwifery, p. 117.

² Lectures on Midwifery, p. 327.

in the same mother. Again, if the uterus itself is misshapen and malformed, a similar result follows. In each successive pregnancy there is the same constant deviation from the normal ovoid form of the uterine cavity, and as a consequence, the same deviation from the normal adaptive position of the fœtus. In the instances which I have quoted above from Walther and Lecluyse, of the recurrence of the same malpresentation in several successive pregnancies in the same mother, the cause of these malpresentations was an irregularity in the configuration of the uterus. The same organ,—as the mouth, nose, hand, &c., &c., is liable, when irregular in form, to present the same irregularity in several members of the same family. The same no doubt holds good in regard to the uterus also. Dr Keiller has informed me of an instance of preternatural presentations recurring in different pregnancies in twin sisters. It appears to me that this curious fact will find its solution in some peculiarity in the form of the uterus repeated in the two sisters.

If the preceding remarks had not already extended far beyond the limits intended, I would have proceeded to show that the *positions* of the head, &c., of the child, in relation to the circumference and different diameters of the brim of the maternal pelvis, are, like the presentations, regulated in their ultimate analysis by the reflex or excito-motory actions of the fœtus. It is only by reference to the reflex excitations and motions of the fœtus, that we can explain, for example, the rarity of the positions of the head, &c., in the direct diameters of the brim, their frequency in the oblique, and especially in the right oblique diameter,—and the greater relative proportion of occipito-anterior than of occipito-posterior positions of the cranium.





