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The Position of the Folio
in literature.

Shells

by
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Note. — Some apology is necessary for the fragmentary form in which this thesis appears. At first I intended to have criticised Hengstenberg's theory on the binding of the umbilical cord and to have compared it with that of Mr. Simpson on the same subject. Unfortunately, however, I have been unable to procure Hengstenberg's pamphlet, and consequently can only offer as a thesis the latter part of the original subject entitled "the motions of the foetus in utero". — G.H.

We now come to the second part of this dissertation; namely, a consideration of those causes which determine the usual position of the foetus in utero at the full term of pregnancy. —

In 96 out of every 100 births, it has been found that the head is the presenting part of the child; but as this presentation only occurs in 96 percent of all premature labours, it is evident that those movements, whether active or passive on the part of the foetus, which determine its usual position, come prominently into operation some time after the middle period of utero-gestation. It would be altogether unnecessary here to point out how the limbs of the foetus are arranged, and the trunk of the foetus curved anteriorly upon itself, so as to fit exactly into the uterine cavity and occupy the least amount of space consistent with the performance of the healthy functions of the child and the comfort of the mother. There is here observed the same harmonious law of adaptation of means to ends which pervades the whole range of vital existence; and those cases which deviate from the normal position are only apparent exceptions. For when the child presents prematurely or otherwise than by the head, we may rest assured that

this presentation is the one that corresponds most naturally to the relations existing between the foetus and the parts or conditions of the mother in any given case.

Without entering into any detailed review of the various theories that have attempted to explain the ~~usual~~ causation of the usual position of the foetus immediately before birth, it will suffice to consider separately those only which have held a creditable degree of prominence in recent times; namely, the gravitation theory, the ~~psychic~~ psychological theory of M. Dubois, and the excit-motory theory of Professor Simpson. Other and older theories are based on grounds so untenable that with the knowledge of the present day any attempt at their refutation would be perfectly superfluous. In passing it may be remarked that the great amount of credence, which every one of the above-mentioned theories has obtained, would naturally lead one to suppose that they are all far too exclusive. Granting it to be true that any one of them is sufficient of itself to explain the rational of the phenomenon in question, it is nevertheless altogether unphilosophical to exclude other causes which may assist in producing the same effect.

It is true that the human mind prefers simplicity to multiplicity in any chain of causation, but it is no less true that the theorist not infrequently blinds himself to everything that interferes with the extensiveness of the application or integrity of his theory, and rather than submit to eclecticism lays himself open to the charge of dogmatism. It can scarcely be consistent with the fairness and candour of scientific enquiry to conclude that a cause, occasionally exceptional in its effect, ought to be entirely banished from the platform of investigation, when we know or have reason to believe that such a cause has at least the power of assisting in the production of the result in question. And this is rendered the more apparent when we reflect that anything which disarranges the conditions under which a given cause acts, naturally leads to disarrangement of its normal effect or to prevention of it altogether.

Let us now consider successively each of these theories as explanatory of the usual presentation of the child at birth; and first, with regard to the gravitation theory:—

I. The conditions for gravitation of the head presented on the part of the fetus are described by M. Dubois as follows: - "Lorsqu'on plonge dans de l'eau tiède des fœtus morts de divers âges depuis la quatrième jusqu'au neuvième mois de la gestation, soit immédiatement après leur naissance, et par conséquent avant qu'ils aient rien perdu de leur chaleur et de leur souplesse naturelle; soit après avoir pris les précautions de les réchauffer et de les assouplir, s'ils étaient déjà morts depuis quelque temps, et leur avoir artificiellement donné, dans tous les cas, au moyen de liens convenablement adaptés, l'attitude qu'ils avaient dans le sein maternel: on ne remarque pas que la tête descende plus rapidement que les autres parties, et qu'entraînée par la prépondérance de son développement, elle gagne, la première, le fond du vase dans lequel cette expérience se fait. Voici ce que l'on peut observer ordinairement lorsqu'on choisit pour ces épreuves des vases dont la capacité représente, autant que possible, celle de l'utérus à diverses époques de la gestation. Ajoutons que, si, pour rendre l'expérience beaucoup plus probante, on plonge les fœtus

dans une masse de liquide considérable, celle que peut contenir une baignoire ordinaire, par exemple, afin que, la chute étant plus lente et le trajet plus long, l'écaille ait tout le temps d'être entraînée la première par la supériorité de son poids, si elle est réelle, cette expérience, qui devait être si favorable à l'opinion généralement admise, démontre de même que toutes les parties du fœtus descendent avec une égale rapidité, que le tronc conserve dans cette chute la position horizontale qu'on a dû lui donner au moment, où on le plonge, que le dos ou une des épaules sont les points qui arrivent ordinairement les premiers au terme de la course". —

These experiments of Dubois, repeated by himself and others, prove sufficiently the fact that the fœtus descends with the cephalic extremity downwards. It is true that this descent of the fœtus through fluid is made with its long axis inclined at an oblique angle to the plane of the horizon; but this in no wise disproves the validity of the gravitation theory, as some believe. For we shall afterwards endeavour to point that this direction of the long axis closely approximates to that of the natural

position of the foetus in utero. Nor is it necessary to maintain that the place of insertion of the umbilical cord into the foetus or the position of the placenta on the internal surface of the uterus should be taken into account. We refer rather to a few objections more plausible, and therefore more worthy of consideration. —

1. It has been concluded, that, because anencephali are often found presenting naturally, this theory is untenable. Both Dubois and Simpson, however, admit that such presentations are less frequent than in cases of fully developed fetuses, and the former so far confesses his belief in the theory when he says that "it is not impossible that the preponderance of the pelvic strength may have some effect in these anomalies." Dr. M. Duncan placed in a solution of nearly its own specific gravity a fresh decapitated foetus and found that it floated obliquely with its neck decidedly lower. But ^{towards the} full time, owing to the comparatively small specific gravity of the amniotic fluid, the foetus is variously placed or some inclined of the uterus according to the predominant attitude or position of the maternal trunk, and it seems natural to suppose that the laws of gravitation would come

more prominently into ^{play} ~~detail~~ than is the argument above detailed. At all events the data and experiments on this point are insufficient to afford ample evidence either for the establishment or overthrow of this theory.

2. It has been found from statistics collected by Dr. Keith that hydrocephalic fetuses present preternaturally four times as frequent as normal fetuses do; and Dr. Simpson has attempted to argue that because the head in such cases is heavier than usual so ought the natural presentation be proportionally more frequent in them. Now this mode of reasoning however, ~~that~~ is an apparent fallacy. Though the absolute weight of hydrocephalic fetuses is increased the comparative weight, or that which refers to specific gravity, is actually diminished. The specific gravity of hydrocephalic fluid is at least one-fiftieth less than the specific gravity of the fetal brain, and as this fluid is slightly lighter than the amniotic, the greater the hydrocephalic head, the less will become its comparative weight. Without going so far as Dr. Duncan is affirming that Dr. Keith's statistics prove rather than disprove the presentation theory, we

can scarcely admit that the objections deduced from them are at all conclusions. -

3. A more formidable objection than either of the above is the one connected with the death of the foetus in utero. Statistics show that dead-born foetuses present naturally far less frequently than living ones. George Osborn's conclusion drawn from these statistics, viz., that the assumption and maintenance of the foetus with the head undermost is not a physical but a ritual act", is altogether illogical, we cannot help thinking that the life of the foetus has something to do with its usual position in utero at the full time. -

It is true that the change effected in a putrid child before birth, may alter in some respects the conditions for the influence of gravity, yet there do not seem to be of such an extent as altogether to nullify the objections above indicated. —

II. Let us now examine shortly into the conditions for the operation of the law of gravity afforded by the position of the mother. —

Dr. Matthew Duncan in an excellent essay on the "Statics of pregnancy," has clearly pointed out that the long axis of the pregnant uterus is inclined to the

plane of the horizon at an angle of about 30° , when the woman is in the erect position. Owing to the conformation of the anterior wall of the abdomen and the increase in length of the uterus itself, this angle of inclination is slightly increased, towards the full time. If now the woman assumes the supine position, it is evident that the long axis of the uterus will be directed towards the horizontal plane at an angle of 60° or somewhat less. In the erect position, therefore, the plane down which the fetus gravitate, almost imperceptible though the force be, will on the whole be about 30° at the full time, when we take into consideration the somewhat conical shape of the uterus; and in the supine position, it will be probably somewhat greater than a right angle. Hence the objection, brought forward by Mr. Dubois and others, that in women who are confined to bed during the whole or the latter part of pregnancy the fetus ought never to present with the head if this theory ~~was~~ true, becomes no objection at all. On the contrary it would seem that if the force of gravity with regard to the fetus acts more efficiently in the one position than in the other, it would be in the supine; for the plane on which the fetus then rests is more nearly vertical

than in the erect posture. - It was shown above
 that a fully developed foetus at the full time when allowed
 to gravitate in a fluid of nearly its own specific gravity,
 and when folded up in a form as ~~nearly~~ approximating
 as nearly as possible to the usual form in utero, gravitates
 with its long axis directed to the plane of the horizon
 at an acute angle; and this angle has been demonstrated
 by actual experiment to approach very nearly to the angle
 of inclination of the long axis of the uterus. Now, therefore,
 we observe that the foetus in utero is under a com-
 plicated series of conditions all most favourable to the
 operation of the laws of gravity in determining the usual
 presentation of the head, affording at the same time the least
 possible amount of interference with the comfort
 or the ^{health} operation of the vital functions of either mother or
 child. The amniotic fluid of a somewhat less specific
 gravity than the foetus itself allows the latter to rest over
 so slightly on some part of the uterine wall; its bland
 nature as well as its temperature, constitutes a most
 excellent bath; the glebous surface of the investing
 membranes present no irritation; and, towards the full
 time, the shape and size of the uterus conforms closely to
 the form and bulk of the foetus with still sufficient

capaciousness & remove any degree of tightness that might otherwise exist. -

It is plain, therefore, that for the most part the position of the woman during pregnancy is always the most favourable to the operation of the lever of gravity in determining the usual presentation at the full time. It is true that, when the woman lies on either side, the plane on which the foetus must then rest will be nearly horizontal, but the greater preponderance of the other position, and the shape of the uterus preventing, at least towards the full time, any marked change in the position of the foetus, renders this consideration of comparative very little value. -

Dr. Matthew Duncan has strongly insisted against Professors Dubois and Simpson for their assumption of the presentation in premature cases as being universally indicative of the real position of the foetus in utero before abortion takes place. I shall take the liberty of quoting his own words: "Statistics show that the earlier the foetus is expelled from the uterus, it is the less likely to present the head as the first part born. But by an unwarrantable and quite unsupported step in reasoning they have been represented as proving the position of the foetus in utero."

These statistics are valuable, simply, as indicating the presentation not before but of during parturition of premature children, and if such is the case they are utterly valueless in the discussion of the question of the position of the foetus before labour, or of its cause, into which they have been dragged. - And again. "We have no evidence whatever that the presentation in a miscarriage or abortion, is identical with the part lying lowest before miscarriage, and we have no means of reasoning from the one to the other". Now though it be true that the greater mobility of the child on account of the greater amount of liquor amnii, and the more rounded form of the uterus during the middle months may in some measure alter the conditions existing at the full time, there can scarcely be of such an extent as to negative altogether the assumption that the presentation in such cases should be regarded as a fair index of the position of the foetus before premature birth. The statistics are ample enough to make from them a legitimate inference; and though that inference is not valuable in maintaining neither the psychical nor ~~excito-motory~~^{theory} it does not in any way invalidate the presentation-theory. When uterine action comes on in cases of premature labour, it is only natural to suppose that the part of the foetus

most contiguous to the os uteri will be the presenting part; or if the foetus were at the time placed somewhat oblique to the long axis of the uterus, it is more likely to be either the cephalic or pelvic extremity. For since the uterus towards its full time, though almost spherical, still approaches a conical form; and since the foetus when folded up is of an oval shape, the contracting uterus, pressing the contained body on all sides, will naturally force the latter to adapt a position in which it fits more closely into the uterine cavity; that is, with either extremity towards the os uteri. According to Dubois and other writers, the cephalic extremity of early foetuses is comparatively heavier than the same extremity of foetuses at the full time. This would a priori lead us to expect a change in the relative position of the early foetus in utero; especially at that period the uterine cavity is large enough to permit the foetus assuming any position. We have already seen that the position which a fully developed fresh foetus assumes when inserted into fluid of the proper specific gravity and with its limbs properly folded up - ~~assumes~~ ^{is} the position it occupies in utero; that is with its long axis

inclined to the horizontal plane at about an angle of 30° ; but in the earlier months, owing to the comparatively greater weight of the cephalic extremity, - the long axis of the child will be vertical or nearly so. Hence the head will not rest at the os uteri as at the full time, but on some part of the ^{lower} uterine walls.

Another consideration which presents itself here is the following: - Perhaps in the earlier months the fetus on the whole may be specifically lighter than at the full time; and were this the case, then it would either float free in the amniotic fluid or rise towards the fundus of the uterus, - so that when labor comes on - the fetus may be compelled to present in a manner not at all indicative of its ^{present} usual position in utero. Exclusive of all this however, it is perfectly possible to conceive that any external impetus might change the position of the fetus while the amniotic fluid is still abundant enough to permit of considerable mobility on the part of the child, and yet the walls of the uterus not so extensive comparatively as to permit a return to the natural position, and hence a preternatural presentation be the result.

But as there are several instances of mal-position concerning which no such physical explanation can be given, we are compelled to admit the influence of other causes besides position. There can be no hesitation, however, in granting that in all normal cases at least the gravitation-theory is sufficiently explainable of the assumption and maintenance of the fetal position in utero; and we have attempted to show that it is ^{even} explainable of some of the apparent exceptions to the general rule. To prove that other causes are in operation in producing the effect in question, does not disprove the possibility of the influence of this ~~other~~. Indeed it would seem to be a fair instance of supererogation, a total abuse of the general economy of nature, to suppose that the foetus must assume and maintain its position in the womb by muscular acts voluntary or otherwise of its own, when we know that it can do so passively. Now it notes it could seldom be in a state of repose; it would resemble, though in a ^{far} ~~substantial~~ less degree, a swimmer struggling against the stream. Even in cases when it is abnormally situated in the uterine cavity, the maintenance of its position may be perfectly passive.

nature just as a person can ^{recline} ~~lean~~ or sit on a couch with perfect if not equal ease. -

Let us now consider some of the reasons (however imperfectly expressed) which warrant us in affirming that the influence of gravity is the principal cause in determining not only the assumption but the maintenance of the normal position of the foetus in utero towards the full term of uterine gestation -

In maintaining this theory also, the statical conditions afforded on the part of the mother and foetal appendages must not be overlooked; for wherever there are of such a nature as to prevent or counteract the usual effect of gravity on the foetus we have a physical explanation of the resulting malpresentation. Some of these have already been alluded to. It must ^{also} be remembered that any cause leading to malformation of the uterus, whether temporary or permanent, must have some influence in effecting a change of the usual position of the foetus apart from any ~~phys~~ muscular efforts of the latter to assume such a position, at least in cases where the mal-formed uterus is of an ovoid shape. For as the foetus gradually approximates in size as well as shape to the cavity of the uterus;

and as the membranes surrounding the foetus are sufficiently smooth to prevent any degree of friction; since too the foetus gravitates with an almost inappreciable force in the amniotic fluid, it is evident that the resultant of all these conditions will tend to force the foetus to assume the position in which it fits most closely into the uterine cavity. It is apparent also that the movements of the mother will have a considerable influence in determining such position.

Notwithstanding all such considerations, however, we must admit the operation of other causes sufficient since there are certain cases of malpresentation which in the present state of our knowledge, cannot be explained satisfactorily by physics alone. — But before proceeding to the consideration of such cases, it is expedient to examine into the nature of the cases in which they are called into operation. —

Allusion has already been made to the inefficiency of physical causes to explain why still-born foetuses present less frequently with the head than living children ~~was at the full time~~. The statistics on this point collected by Dr. Simpson are as follows:—

	Living Children	Putrid Children
Cephalic Presentations	98 in 100	83 in 100
Of children born premature during the ^{9th} month		
Cephalic presentation	83 in 100	46 in 100

Dr. Matthews Duncan writes with regard to this part of the subject:— I regret to have only a single observation to adduce in advancing this question towards solution. So far as it goes it tells against the arguments of the opponents of the gravitation theory. I floated in a solution of salt of about its own specific gravity, a six months' fetus born dead, and with the skin peeling off. The position it assumed was exactly the reverse of that taken by the fresh child at the full time. The putrid fetus floated with its long axis directed obliquely to the horizon, and with its head highest. In labor it presented the breech?—

So far then as regards the statistics given above of children born during the 9th month, we may take this single specimen of Duncan as illustrating how abnormal presentations may be more frequent than in the case of dead born fetuses. At the same time it must be allowed that this seems to be a good deal of plausibility in the argument advanced by the opponents of the gravitation theory. It nevertheless

becomes an exceedingly difficult question to decide how far such results are due to the mere death of the child, or to changes thereby produced in the usual physical conditions. And this is partly owing to the want of a sufficient amount of data experiments on the matter; partly also perhaps to the fact that we have no means of ascertaining whether the mal-position of the fetus in such cases has really been subsequent to its death, as the question presupposes. Yet it is perfectly possible to conceive that the mal-position in some instances, has been the cause and not the effect of the child's death; or at least that it may have been antecedent to it. - On the other hand, it can scarcely be denied that the muscular movements of a living fetus, being chiefly confined to the lower extremities, do exert some influence in rectifying any deviation from the normal position resulting from movements on the part of the mother or other external causes. Without making such an admission, we can scarcely, I think, account for the greater proportion of mal-presentations in the case of still-born children, which the statistics above quoted afford us. - At the same

hine they do not seem to form such an objection to the parabolic theory as the opponents of that theory maintain. —

With regard to other causes of malpresentation, such as "spasmodic contraction of the uterine parietes - organic disease of them, placenta praevia", and "distortion and contraction of the brim of the pelvis", we beg to make the following observations: —

1. In all of these instances, the ordinary physical conditions in determining the usual position of the child so far as the mother are altered; and hence it is not unreasonable to expect deviation from the normal result apart from any influence depending on the muscular movements of the child. For example, in the case of spasmodic contraction of the uterine parietes or in organic disease of them, a certain part of the organ may so press upon the body of the child as to cause displacement of the latter. In placenta praevia and distortion and contraction of the brim of the pelvis, the uterus may be so altered in shape as to present its longest diameter in a direction either oblique or transverse

to the axis of the brain, and we have shown above that in such cases there is a mechanical tendency in the fetus to approximate itself conformably to ~~the~~ ^{such} abnormal shapes of the uterus.

Before concluding this part of the subject, it may not be out of place to allude to an objection forwarded against the gravitation-theory, which M. Dubois states as follows: — Les fœtus de l'espèce humaine ne sont pas les seuls qui jouissent de l'avantage (car c'en est un bien réel) d'être placés, dans les organes maternels de manière que, au moment de la parturition, la tête précède les autres parties, et leur faire, en quelque sorte, un passage à travers des voies étroites, et quelquefois très résistantes. Les autres semblent avoir pris les mêmes précautions à l'égard des fœtus de beaucoup d'autres espèces d'animaux; cette observation s'applique en effet à tous les mammifères quadrupèdes." — I do not think, however, that this statement implies any formidable objection to the gravitation-theory. For if we examine even cursorily, into the conditions to which the fetus is subjected in uniparous animals such as the cow, the mare, &c., we shall find

the analogy is scarcely complete. - In the cow or mare, for example - the uterus is pendent towards the fundus; that is to say, the long axis of that organ is directed to the plane of the horizon in a downward direction. We would consequently expect that the foetus in these animals would gravitate with the heavier extremity towards the fundus of the organ; and this is found to be actually the case. The foetus of these animals, unlike the human foetus, is heavier towards the pelvic extremity. It therefore assumes that position in the uterine cavity which the physical conditions under which it is situated, necessitate. -

To endeavour to overthrow the gravitation theory by bringing forward, as illustration, ~~the case as presented~~ ~~of a~~ animal with multilocular uteri, is attempting to reason where no analogy exists; at least so far as this question is concerned. At best it only shows that, in some of the mammiferous animals, there are other causes which determine the position of the foetus, than the force of gravity; but it in no wise disproves the influence of that power in human pregnancy. While, therefore, we do not deny

that muscular movements on the part of the foetus may occasionally exert an influence in assuming and maintaining its position *in utero*, we nevertheless believe, on grounds above stated, that this position, in by far the great majority of cases, is determined by physical causes.

Let us now examine into the value of the psychological theory relative to this question.

Previous to the appearance of M. Dubois' essay on the "Déterminations instinctives du fœtus," several psychologists and physiologists had been of opinion that the foetus towards the full time was not only capable of performing voluntary movements but had already so far advanced in laying the basis of its future ideology. Thus M. Cabanis says, "Nous voyons que le fœtus a déjà reçu les premières impressions dont se composent l'idée de résistance, et celle des corps étrangers, et la conscience du moi; car il exécute des mouvements, qui sont bornés et entrainés par les membranes dans lesquelles il est renfermé; il a le besoin et le désir, c'est-à-dire la volonté d'exécuter ces mouvements; et quant à la conscience du moi on peut croire qu'il lui suffirait pour l'acquiescer, d'apprécier

des impressions de bien-être et de mal-aise, et de l'envie, pour prolonger les unes et faire cesser les autres, des efforts voulus, quelque mal conçus et vagues qu'on puisse d'ailleurs, les supposer. J'ajoute que, pour recevoir la sensation de résistance, la présence des corps extérieurs ne parait pas indispensable, puisque le poids de nos propres membres, et les forces des muscles nécessaires pour les mouvoir, qui sont l'un et l'autre très-variables, ne peuvent manquer de mettre le moi dans cette même situation, d'où l'on sait maintenant que résulte pour lui, l'idée des autres corps." -

Although Mr Dubois does not go so far in his generalization as Mr Gaboris, he still maintains that the foetus has the power of sensation and locomotion, that its movements are not the result of any automatic arrangements in the foetal economy but the direct consequence of voluntary impulses. It is indeed somewhat difficult to understand what he meant by "instinctive determinations"; but his doctrine seems to imply that the position of the child in utero is attained and maintained by some species of wisdom on the part of the child.

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There can be little doubt that if the excitatory properties of the nervous system had been fully known when such views were entertained, many of them would have been greatly modified. Men were compelled to adopt such opinions, because otherwise ~~the~~ many of the fetal phenomena were inexplicable to them. Some went so far as to believe that the position of the child's head at the full term was the result of a culture which the foetus performed shortly before birth. Indeed it would seem that many scientific men regarded the foetus as not only endowed with the instinct characteristic of the lower animals but was also in a certain sense capable of making generalizations indicating of a no small amount degree of mental development. More especially did the Materialistic School of philosophy make researches into this department of psychology. Both Cabanis and De Tracy, as well as Gall and others wrote upon the subject with the ability that has now been so justly named. The first determinations of "sensibility - first ideas, and first thoughts" were all carefully analysed; and it was believed

that a firmer basis than ever was laid for the ^{general} ~~sentations~~ - philosophy of Locke and Condillac.

It would be altogether unnecessary here to either to point out or attempt to refute much that was extravagant in the views held by these theorists; it will suffice if we examine more especially into the less pretensions nature of Dubois' doctrine.

Dr. Dubois founded his theory not only on the phenomena of presentation, but rendered it still more probable by adducing various acts or movements of the foetus which he could explain in no other way. It is well known, for instance that frequently ~~the~~ pregnant woman is compelled to lie on one side on account of the discomfort caused by the ^{movements} ~~actions~~ of the foetus if she attempts to lie on the other. Again, many women can make movements on that part of the foetus by pressing on some part of the abdomen. If the umbilical cord be compressed, the child's limbs are thrown into convulsive movements similar to those seen in animals threatened with asphyxia. It had been observed also that the foetal movements are often increased towards night. They

are especially marked in cases in which the
another had suffered greatly from want of food.

By facts like these M. Dubois endeavoured
to establish his doctrine which he illustrates as
follows: - "Ainsi, la construction d'un nid pour
l'oiseau, voilà l'acte instinctif, le but de l'im-
pulsion irrésistible; mais le choix d'un lieu
convenable, à l'abri des dangers ou des rigueurs de
la saison, la recherche et l'emploi des matériaux dont
l'édifice se compose, voilà les actes particuliers. Le
premier échappe à la volonté et à l'intelligence;
elles ne peuvent ni l'ordonner ni le suspendre. elles
n'ont pas même la puissance d'en modifier
le plan général, ni la situation qui sont toujours
les mêmes dans les mêmes espèces. Les autres
actes, au contraire, peuvent offrir aux yeux
d'un investigateur minutieux des nuances
sensibles dans la capacité, l'adresse, la rapidité
avec laquelle ils sont exécutés". - It would
thus seem that M. Dubois maintained that
the fowler had the feeling of sexual impressions
exciting the exercise of its locomotive power.
That hence it possessed "spontaneous and

and 'intentional determination' as well as internal perceptions, - that it had the feeling of comfort and discomfort - and probably desired and volitions.

There was one great objection, however, brought forward against such opinions. Several cases of anencephalic foetuses were described, in which the whole of the cerebrum and cerebellum was wanting, and yet some of these foetuses retained life after birth for several hours after birth and performed all the acts of normal foetuses. They were observed to cry, though in an imperfect manner, to suck when the nipple was applied to the nipple, and to endeavour to clasp anything put into their hands. In short they behaved as normally developed foetuses, both before and after birth, though in a less complete manner. It was thus rendered apparent that, ^{either} mind was not wholly confined to the cerebrum and cerebellum, or that there existed in the foetus ~~cerebrum~~ some nervous arrangement productive of muscular movements which could ~~not~~ be termed

* With reference to this Sir. W. Hamilton says:— There is no good ground for believing that the mind is situated solely and ~~exclusively~~ in the brain, or exclusively in any one part of the body. On the contrary, the supposition that it is really present wherever we are conscious that it acts, — in a word, the Peripatetic aphorism, the soul is also in the whole

neither voluntary nor instinctive. With regard to the
 former of these suppositions, all philosophers are agreed
 that the encephalon is the seat of mind, though no one
 has been able to advance any satisfactory ^{theory} to explain how
 the immaterial mind is united to the material brain.
 We are therefore compelled to admit the latter supposition
 as explanatory of the majority if not all of the motory
 phenomena of the foetus. At the same time, it must
 be ^{admitted} that many phenomena observable in the lower
 grades of animal life give evidence of the existence of
 a higher instinct than that claimed for the foetus, and
 yet in these animals, nervous ganglia are in the
 minimum. In the bee, for instance, so-called in-
 stinct is largely and beautifully illustrated, though
 no such structure as the brain overabounds ~~in~~ in
 that insect. I have brought forward this sug-
 *gestion, because the late Sir W. Hamilton was of
 opinion that as far as sensation was concerned
 mind was not confined to the encephalon; and
 consequently, that the supposition of even anencephalic
 foetuses being endowed with sensation to a certain
 extent does not seem so preposterous as might
 at first sight appear, though at the same time

and all in every part, - it more philosophical, and
consequently, more probable than every other opinion.
+++++ We have no right to say that mind
is limited to one part of the organism; for even if
we admit that the nervous system is itself uni-
versally ramified throughout the body, the part to which
it is proximally united, into the nervous system it
itself universally ramified throughout the body; and
we have no more right to deny that the mind feels
at the finger-points, as evidence assures us, than
to assert that it thinks exclusively in the "brain".

These also I believe wrote a pamphlet
to show that there may be sensation without the
head. The pamphlet is entitled - Gedanken
von Klapka und dem Fräulein Adelgunde
Klapka über das menschliche Gehirn.
Göttingen. -

I do not believe that such a doctrine can ever be established. — But while we admit that many of the ~~while the~~ movements of the foetus are purely the result of reflex action, I am far from disbelieving that the foetus is devoid of sensation. On the contrary we have every reason to believe that many of the foetal movements are caused by actual feelings of comfort or discomfort on the part of the foetus, and consequently spontaneous. How ^{otherwise} can we explain, for example, those movements which take place when the mother is entirely at rest? If such were caused by mere irritation of some part of the cutaneous surface of the foetus as the ~~auto-~~ history theory presupposes, why do not such these movements take place immediately after the mother adopts the ~~fixed~~ position in which they occur? But beside these considerations, there are others which a priori lead us to the conclusion that the foetus has sensation. It presents, for example, all the conditions compatible with, or rather productive of sensation. The nervous system towards the full time is sufficiently developed to this end,

and we have no reason to believe that the external or other surfaces are in such a state as to prevent the influence of external impressions. - Again, it is now well known that a viable foetus may live between the sixth and seventh months of utero-gestation, but is it possible to maintain that such a foetus at the end of two or three months is wholly devoid of sensation and volition, and yet at that ^{of time} lapse, the ordinary term of utero-gestation is only completed? Against all this it may be urged that if the foetus were endowed with sensation its position would be one of permanent discomfort because the situation is so repugnant to our views of comfort. Yet the same feeling is evinced when we see a child taking delight in "paddling in a gutter"; and for all that we know, its situation may be such as to afford it feelings of greater comfort than any other possible; and hence it might be maintained that to deprive the foetus of sensation would be depriving it of a source of real pleasure.

But this supposition of the existence of foetal sensation and volition is

rendered highly probable by analogy. - It is impossible, for example, to maintain that the phenomena presented by the chicken in busting its shell, can be explained by reflex-action. - There is here evidence of volition to a certain extent and distinct too. For it has been observed that a chicken on busting its shell, having seen a spider crawling along the shell-wall - has withdrawn its head till the spider came within reach, and then thrust out its beak and seized it. Illustrations might be drawn from almost all the lower animals to prove that the young almost immediately after birth are capable of performing movements which presuppose the existence of will or instinct. - It is true that the child at birth is more helpless than the young of any other animal, but this is no reason why we should urge the improbability of its possessing ~~instinct~~ volitional power before it is born. Immediately after birth, no one, as far as I am aware has proved that the child is altogether a mere machine whose actions are regulated solely by reflex the laws of reflex action; and it does seem strange that ~~instinct~~ and

position should be suddenly imparted to the foetus
 at the commencement of this new phase of its existence,
 being that the conditions requisite for their production
 existed before. - It may be here asked, would it
 not evidence cruelty in the arrangements of nature
 were the foetus endowed with sensation considering the
 amount of pain which it must suffer during the
 process of parturition? But this may be answered,
 pointing out that the amount of pressure to which
 the cranium is then subjected is in general so
 great as to induce insensibility, especially since
 the cranial walls can be easily compressed owing
 to their want of any sufficient degree of rigidity,
 and in the comparatively few cases, if such there be,
 when the pressure is not so great as to produce
 temporary insensibility, then it is not of an extent
 to produce any appreciable amount of pain. -

I will not attempt to support this argument
 by maintaining, as some have done, that cold
 when applied to the abdomen of the mother produces
 movements on the part of the foetus because the foetus
 is sensible of a change of temperature thereby brought
 about, in some part of the uterine wall. -

Dr. Simpson has questioned the fact of foetal movements ever taking place under these circumstances, at least as an effect induced by the cold alone, ~~but~~ attributes them to the pressure on the abdominal walls setting up reflex action on the part of the child. Whether this be true or not it does not in any way invalidate his theory, for I believe that heat or cold can set up excitatory movements without ^{there being} substantial contact with any part of the cutaneous surface. — The advocates of the excitatory theory have also found some difficulty in accounting for the convulsive movements that take place on pressure of the umbilical cord, as well as those movements observable in cases of great deprivation of food on the part of the mother. I do not bring forward these before in any way the existence of sensation in the foetus, but merely to state that though ~~the~~ all the links in these chains of phenomena have not yet been pointed out, the rational of the whole does ^{not} seem to lie beyond comprehension. ~~Like~~ the foetal blood is oxygenated in its passage through the placental tufts, compression of the cord

will induce the circulation of venous blood through the system of the foetus to an abnormal ~~extent~~ degree; for cessation of the placental circulation does not necessitate immediate cessation of the foetal circulation itself. As far then as the nervous system is concerned, the foetus, when the cord is compressed, is in the same condition as an animal which is being asphyxiated. Now, the late Dr. John Reid has clearly shown by experiments and reasoning the most conclusive, that the derangements in the nervous system observable in cases of asphyxia are due not to any change in the force or rapidity of the flow of blood, as some have supposed, but to the altered condition of the blood itself. We have therefore only to suppose that the electrical relation (or of whatever other nature that relation may be) which exists between the life-giving blood and the life-regulating nervous system, is altered. The connecting arrangements of this diffused battery, so to speak, are disordered — hence its spasmodic action, and as the derangement becomes more complete, its final inability to act. — In cases of convulsive movements resulting from deprivation of food on the part of the mother, a similar explanation might be given.

for here again, the condition after blood must be changed to a greater or less extent. In both cases the polarity of the spinal system is temporarily destroyed, for it is not altogether improbable that the foetus blood may be changed in a manner either identical with, or analogous to, that which exists in cases of so-called warm poisoning, seeing that we have no right to assume that carbonate of Ammonia as Grunich has shown, is the only peccant matter capable of overcoming this so-called spinal polarity.

But though we believe that such movements are capable of being explained on physiological principles, we nevertheless think that they may also be partly attributed to a feeling of ^{dis}comfort or pain on the part of the foetus thereby giving rise to them. At all events if we grant that the foetus has sensations, ~~the~~ ^{an} explanation of them is rendered not so difficult.

Before concluding this part of the subject, it may not appear altogether preposterous to examine into a question which has somehow forced itself upon our minds. It is this. Is it not possible to explain some of the movements

of the fact in a manner otherwise than that
afforded by either the physical or excit-motory
theory? -

I think it is now established beyond all
reasonable doubt that the human is often un-
consciously modified, that is to say, that there exists
a certain mental latency, just as there exists
a certain latency of heat, for example, in various
material substances. To Sir W. Hamilton, the greatest
of modern philosophers, are we indebted for the
full elucidation of this doctrine at least in this
country. So shortly considering it therefore, I shall
endeavour to give a short and synoptical view
of the mode in which he reasons on the subject.
To simplify his discussion he divides mental latency
into three degrees :-

1. The momentary activities of our mind
are no index of its actual possession. For ex-
ample a man knows a science, or language
not merely while he makes a temporary use
of it, but inasmuch as he can apply it when
and how he will.

2. It is well known that there exist

in the mind "certain depths of knowledge or habits of action" which it is wholly unconscious of possessing in its ordinary state, but which are revealed to consciousness in certain extraordinary exertions of its powers". In the records of somnambulism, insanity, and of certain diseases or lesions of the brain, we have ample evidence that sometimes the strict memory of whole languages was restored "and what is even ~~still~~ more remarkable" that there have been instances "in which the faculty was exhibited of accurately repeating, in known or unknown tongue, passages which were never within the grasp of conscious memory in the normal state". The testimony in support of this is so ample and unambiguous that there is nothing more firmly established in the whole range of physiological psychology. —

3. The third degree of mental latency is expressed in the following question problem:—"Are there, in ordinary, mental activities and passions, of which we are unconscious but which manifest their existence & effects of which we are conscious? This problem is solved in the affirmative as follows:—

"Force" To be conscious, we must be conscious of some particular perception, or remembrance, or feeling, &c. we have no general consciousness. But as consciousness supposes a special mental modification of its object, it must be remembered, that this modification or state supposes a change, — a transition from some other state or modification. But as the modification must be present, before we have a consciousness of the modification, it is evident, that we can have no consciousness of its rise or awakening; for its rise or awakening is also the rise or awakening of consciousness." —

"But how can knowledge come out of ignorance — consciousness out of unconsciousness — the known out of the unknown — how can one opposite be made up of the other?"

The answer is given in the following evidence: — In common vision, we all know that if the superficies of any solid object, and consequently the complement of rays which it reflects, be diminished to so certain extent, the object can longer be seen; that is to say, the minimum visible is no longer visible to us. Now if we divide

this minimum divisible into parts, each part, taken of itself, cannot be an object of vision or visual consciousness; - they are all in short to consciousness at zero. - But it is evident that each and all of them must have produced a certain modification though imperceptible also the minimum visible could not itself have been visible.

When we look at a forest for example from a distance, we behold an expanse of green; yet no particular ^{leaf} nor even tree may be visible. "But the greenness of the forest is made up of the greenness of the leaves; that is, the total impression of which we are conscious, is made up of an infinitude of small impressions of which we are not conscious."

So also with the minimum audible.

As we stand by the roaring sea - or the babbling brook, we only hear a confluent of sound. We do not hear the ~~dash~~ splash of each wave or the quiet splash of each ripple, yet if the parts did not produce an impression, though imperceptible to our ~~affair~~ of ear, the sum would be to us at zero. - This same holds good with

we
do

taste and touch and smell. -

But we have also evidence in other mental processes. - When a person allows himself to fall into a strain of thought, that is to say, when he allows the mind to wander hither as it pleases, he cannot fail being struck by the connected form of his thinking. One thought as it were suggests another and so on; and the more closely one studies this subject the better qualified is he to appreciate this law of the suggestion of ideas. At the same time, it cannot fail be observed that one idea may follow immediately on another without there being any apparent connection between ^{the two} either by similarity, contrast, or otherwise. How then is this phenomenon to be explained? Mr. Stewart attempted to account for it by supposing that some intermediate idea or ideas formed the connecting link between the two, that these ^{are} for instant are awakened into consciousness, but in the same moment are utterly forgotten. Sir W. Hamilton, more philosophically I think, explains it in thiswise. "Suppose, for instance, that A, B, C, are three thoughts, that A and C cannot immediately suggest

each other, but that each is associated with B, so that A will naturally suggest B, and B naturally suggest C. Now it may happen that one are conscious of A, and immediately thereafter of C. How is this anomaly to be explained? It can only be explained on the principle of latent modifications. A suggests C, not immediately but through B; but as B, like the half of the minimum visibile or minimum audibile, does not rise into consciousness, we are apt to consider it as non-existent." It is just like placing a number

of billiard balls in a straight line and in contact with one another; if the ball at one end is struck forcibly and deftly in the line of the row, the ball at the other end flies off, without the others shifting their position. -

Hence it is that we are able to explain those strange phenomena connected with acquired clerical and habits. A young lady for example may be seen playing the piano skilfully and rapidly while at the time she may be carrying on a connected conversation with the person of her side. She is

not only entirely unconscious of originating & volition the movements of every finger, but she is also unconscious of determining the successive keys ~~on~~ which the fingers are to touch. So is it also with almost all manual exercises which have become habitual. At present, for example, while I trace these words on paper I am altogether unconscious of the complicated process going on within my mind which directs the movements of the pen and the separate spelling of every word. —

But the doctrine is capable of farther extension. It is a matter of every day notice with most people, or at least it might be, that they are actually unconscious of performing acts which necessarily imply a latent volition to originate them, and of receiving external impressions palpable enough in themselves but which nevertheless do ^{not} give rise to actual sensations. So walking for example we are not conscious of willing that each limb shall move alternately, nor in ordinary conversation are we conscious of calling up and arranging the words individually so as to express

our ideas; far less are we conscious of ^{voluntarily} the nature
 and extent of the movements of the tongue, lips,
 and larynx necessary for the pronunciation of our
 words, and yet some power of the mind must
 determine such movements otherwise they could
 not exist unless we suppose that man is a
 mere automatic machine. Again, it some-
 times happens, for instance, that a person searches
 the whole room for his hat after he has placed
 it on his head - and so soon as he is made
 aware of his mistake he feels it to be there.
~~Now~~ A person may be so absorbed in thought
 that he is altogether unconscious of the scene in
 which he is gazing - and yet the picture of
 the scene is on his retina. I may hear
 the time-gun from the castle fired one day but
 under the same external impression conditions
 I may not hear it on another. Now these are
 instances of impressions being received, at one
 time productive of sensation, while at another
 they are not, and all this due to some state
 of the mind itself. Such is the doctrine of

the duality of consciousness. I have brought it forward not only because I believe it may account for some of the fatal movements, but also because I think that some of the movements ordinarily called reflex are also capable of being explained by it. If the foot of a person be touched during his sleep it may be moved in one direction and to a certain extent at one time, while at another if the same part of the foot is touched and with the same force, the limb ^{may be} moved in a different direction and ~~at~~ ^{at another time}. For instance, the flexors of the thigh may move the limb in the first ~~instance~~ ^{experiment}, while the flexors of the leg ~~may be~~ the motors in the second. How then should the reflex stimulus be propagated along a set of nerve-fibrils at one time and along a different set at another time being that the afferent fibrils are the same in both instances? — Dr. Sellar, at a conversation held in Edinburgh on June 6th 1859, read a paper in which the following statements, with (which every one must homologate), appear: "Consciousness itself — the peculiar attribute of mind —

as often as it constitutes a sensation, recognises itself as existing in the point of the bodily frame at which the impression is applied. It is the same in the adult as in the child - it is made known to all of the proper metaphysical evidence of self-consciousness; for example, no one can doubt that when a point of a needle is thrust into the skin, the seat of the consciousness of pain is in the very place touched by the needle. x x x x x

Consciousness exists in every sensible point of the bodily frame, as often as any impression whatever affects such a sensible point. - This last statement is evidently loose and erroneous, and perhaps I ought not to have quoted it. But what I would endeavour to establish is this - that since the seat of the consciousness of pain is the very seat which receives the external impression, it is not illogical to infer that such consciousness even in a latent condition, that is to say without there being any actual sensation produced by the impression, may originate some of those acts or movements which are ordinarily called reflex. A prick of a pin for example will cause

a person voluntarily to move his limbs if he
 be awake - is it not natural to suppose that
 the movements produced by a prick of the same
 intensity and in the same locality, when he is
 asleep, are originated by a latent volition?

I think it is proved beyond the possibility of a
 reasonable doubt that the mind as well as the
 reflex system never sleeps. It is always active
 though we are not always conscious of its activity;
 and hence I believe that some reflex acts are
 identical with acts produced as the result of
 actual sensation with this difference that the im-
 pression in the one case is virtually perceived or
 felt, in the other only latently so -

I make this hypothesis with reserve
 because to elucidate it completely, or at all events
 to consider it carefully, would require more time
 and research than the spare hours of a busy
 session permit. At the same time, it may
 not be cleared altogether out of place because
 the facts adduced in endeavouring to give it
 some degree of probability, are necessary to
 explain a class of ^{fatal} movements which may

be accounted for otherwise than by the excitology or psychological theory.

We have seen that an adult person performs many movements of which he is altogether unconscious. - So sleep also a person often moves his limbs and shifts his position, not as the result of any impression giving rise to reflex action, but brought about by these so-called latent modifications of the mind. And as in the adult so I believe it to be in the foetus. We have elsewhere shown that many of these movements cannot be due to reflex action, seeing that they often take place when the mother has been for some time perfectly at rest. To say that they are always the result of sensation would be inferring more than legitimate analogy afforded by the adult warrants; we therefore believe that many of them are explained by this dual doctrine of the dual of consciousness, the more especially when we consider that the foetus resembles somewhat a hibernating animal - sleeping much compared with the adult. -