Physiology of the uterus, placenta, and foetus, with observations on the membrana meconii and rete vasculare, newly-discovered structures existing in the foetus and young of man and animals / by Benjamin Ridge.

MECONIC MEMBRANE
AND
RETE VASCULARE
BY
Dr BENJAMIN RIDGE.

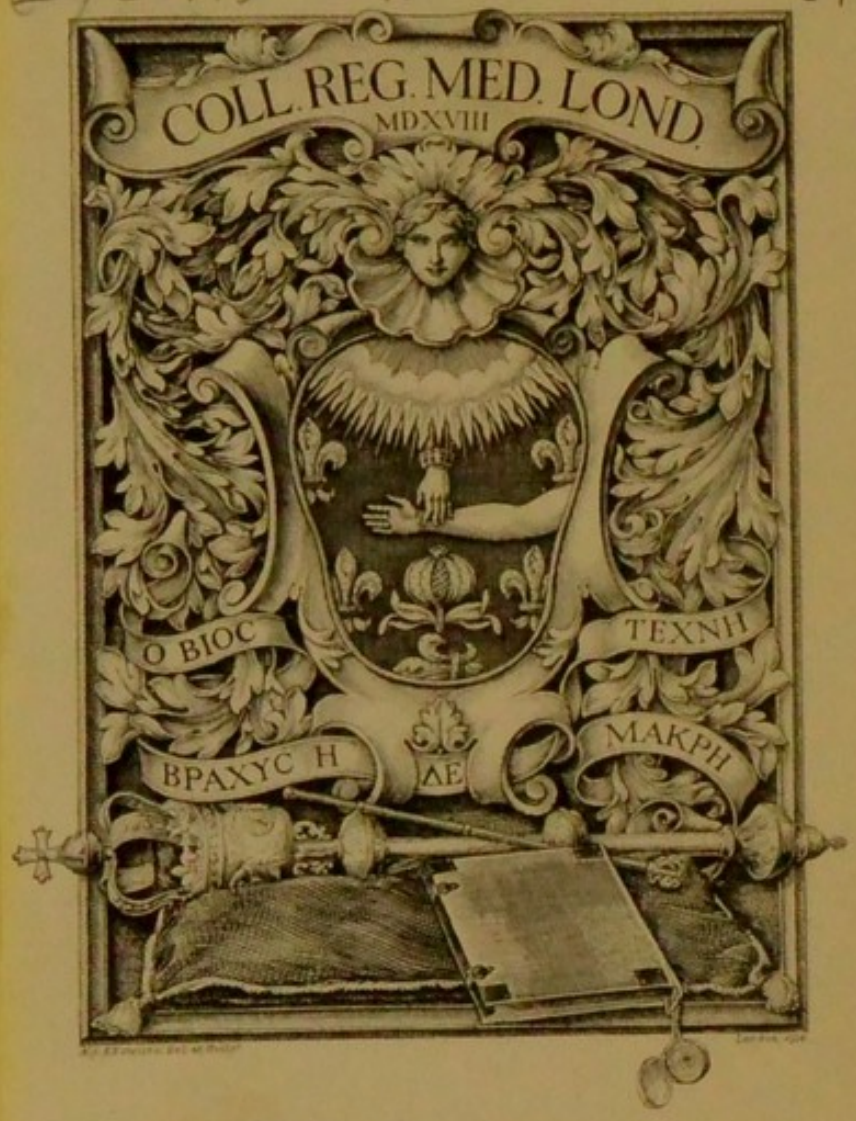

Fig 1.

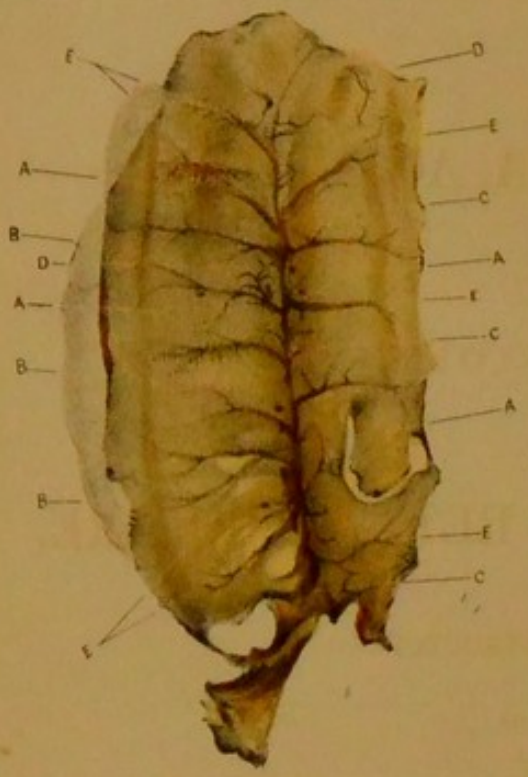

Fig 2.

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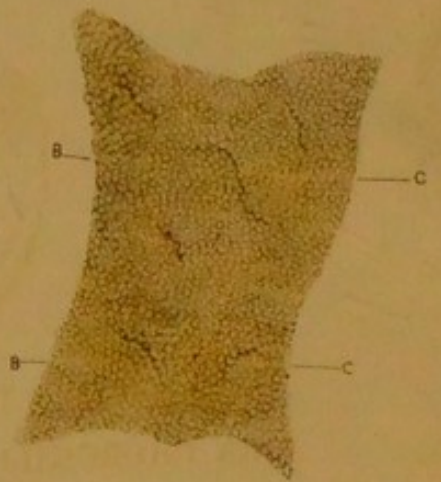

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PHYSIOLOGY

OF THE

UTERUS, PLACENTA, AND FŒTUS:

WITH

OBSERVATIONS

ON THE

MEMBRANA MECONII AND RETE VASCULARE,

NEWLY-DISCOVERED STRUCTURES

EXISTING IN THE

FŒTUS AND YOUNG OF MAN AND ANIMALS.

BY

BENJAMIN RIDGE, M.D., M.R.C.S.E.

&c. &c.

Author of 'A System of Glossology; or the Additional Means of Diagnosis of Disease to be derived from Indications and Appearances of the Tongue.'

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CONTENTS.

"Do not all men complain how little we know, and how much is still unknown. And can we ever know more, unless something *new* be discovered?"

Burnet.

PHYSIOLOGY OF THE UTERUS,

&c. &c.

Section I.—THE UTERUS.

That the human race accommodates itself to its extent of knowledge is a truth which cannot be refuted: equally true is it that men in every current age look on all new doctrines with distrust, and even suspicion, as interfering with this accommodating and somewhat prejudiced principle. But when discoveries, ripened into real benefits, have first upset and then supplanted old philosophy, men then wonder how their previous philosophy could have lasted so long, and been maintained so satisfactorily. It is not, however, the province of the new age to dissect the ingenious arguments of the ancients in order to keep up their fabrics, but to exert itself in the field of enquiry, and, if possible, discover what has escaped former ages; and this being done, to re-form the ancient, or make a new, philosophy more suitable to its own wants.

"The modern science of Physiology has left the track of Aristotle. To the eternal advantage of science, and to the benefit of mankind, it no longer invents a *horror vacui*, a *quinta essentia*, in order to furnish credulous hearers with solutions and explanations of phenomena whose true connexion with others, whose ultimate cause is still unknown."*

It is to the increasing desire to ascertain causes that I would direct my attention, and write without being bigoted

* Liebig.

to prevailing doctrines; but rather viewing such as we have as guides, retaining those which merit permanent belief, yet at the same time entertaining the right to question those which are not based on equally sound reasoning.

In the first place, we must consider that all organs perform destined functions; and when these are once assigned they are not to be tortured in any way to suit the purpose of those physiologists who cannot maintain their arguments without supposing change of function, or offering probabilities, to meet them.

The Uterus, which is designed by a wise Providence as a depositary for the growth and maturity of a future being, should, above all other organs, have its functions clearly examined and defined. In the human female we find the uterus, up to a certain time, a vegetative organ only; increasing in perfection with the age of the subject; until, having arrived at maturity, we find it performing a duty regularly which was unknown to it before. This duty may or may not be performed correctly; but it behoves us, in the first place, to consider it while in a state of integrity. The new function being fully established, consists of a periodical flux of a secretion formed from the blood, which is directed to it for this end; yet, to all appearance, in the unimpregnated state of the organ, this is an *excretion*, inasmuch as, in this state, it is not required for any specific purpose, and it should therefore come freely away. If the material vitality of our bodies depends on the chemical forces of their constituents, which it does, no doubt, to a great extent, we must suppose a constant arrangement of atoms to take place, forming different compounds. Thus, as long as the uterus is unimpregnated, its simple function appears to be to secrete and eliminate a fluid from the blood, which has a different arrangement of atoms from the

blood out of which such secretion was made. The first is properly decarbonized, and consequently arterial, blood, like that which is supplied to every other organ of the body. The second is catamenial, and only resembles the first, or arterial, blood in colour, and even in this not completely. What its alteration is it is not important now to relate: we all admit a change, which is sufficient. The residuum of the arterial blood sent to the uterus, after the catamenial secretion has been formed, returns through the uterine veins of the parent, precisely as all other sanguineous residua or venous blood returns into the system. In the unimpregnated state of the uterus, the catamenial fluid or secretion, thus collected during a certain time, is periodically discharged, not only out of the uterus, but out of the system altogether. It becomes, therefore, a matter of enquiry how the uterus performs this duty; whether or not its action is similar in one respect to the spleen, in simply altering the blood at the capillary termination of its arteries and commencements of its veins: with this difference, that the uterus throws off the secretion or catamenial fluid from its capillaries by a filtering process peculiar to itself, whence it finds its way into the cavity of the uterus.

But whether this happens from all parts of the internal structure, or whether it seeks one outlet towards the fundus of the uterus, is an interesting enquiry:—if the latter, it should be near to where the membrana decidua reflexa forms to envelope the Ovum, which gradually pushes this new body forward; and which, in forming, includes the opening through which the catamenia passes, thus retaining within it that fluid after impregnation; and, from the action of impregnation on the internal portion of the uterus, such a thickening of its lining membrane ensues as to entirely seal up the os tincæ. Such a supposition may

have led modern pathologists and embryologists to the belief, that the true catamenia does not pass periodically out of the uterus during pregnancy. From a number of well-authenticated facts, it is ascertained that women do have discharges during pregnancy resembling the catamenial. In some it may happen from an over-supply of catamenial fluid beyond what the placenta can make use of, coming away through a rupture of the deciduous membrane, thereby considerably relieving the uterus itself and the functions of the placenta when overburdened by this excess of supply; and this may occur once, twice, thrice, or more in the same individual during one pregnancy. Nor does this militate against the laws of Nature in restoring the integrity of the decidua precisely as it does that of all other membranes when injured. Nor do I see anything impugning the probability of a regular catamenial discharge from the uterus during pregnancy, supposing that the decidua did not wholly take in the orifice for the discharge of the catamenia, or neglected to include those parts of the internal portions of the uterus from whence these springs arise: nor from the fact of Nature doing the same here as she does in other cases, *i. e.* become her own physician, and relieve an overcharged organ herself. This and similar actions have been wisely called the *Vis Medicatrix Naturæ;* though by some these actions have been unwisely denied her.

I do not think it by any means so rare an occurrence as some authors believe that the catamenia should wholly and altogether cease during pregnancy: though the rule holds good in by far the most numerous cases, yet exceptions do occur.

I give the following cases on my own personal knowledge from my obstetric Case-book:—

Case, No. 21.—E. R., a laundress, aged 31 years, lymphatic temperament, light hair and eyes, middle stature, good character, married; has had three children born alive, and two miscarriages. Altogether she has been six times *enceinte* in four years. She suckled her second child till within six weeks of her confinement with her third. Confined with her third child in July 1836. Spoke to me at the latter end of May 1837, and requested my attendance at her approaching accouchement. I had previously been attending the child she was suckling for hydrocephalus; a fractious, peevish child, with scarcely a sign of hair on its head, although ten months old. The whole surface of its head exhibited an interlacement of large deep-blue veins. I had not attended it more than a week before the mother suddenly lost her milk; and it was then she told me she expected she was *enceinte*, and, from her feelings, looked for her confinement some time in the following month. The child was taken to town to a friend's, and died there in a fortnight. As the parent's case appeared singular, I was careful in collecting her history. I learned from her the previous observations, as well as the following, *viz.*, that ever since the birth of her third child she had been regular in her catamenia, and they were present when her milk left her, and she expected to have had them again, but at the time of their next return she was confined by me instead. Her state for the last twelve months stands thus:—

July 1836, confined:

August, September — Catamenia and lactation going on regularly.

October, November, December, January, February, March, April, May — Catamenia, lactation, and pregnancy going on uninterruptedly and regularly.

June — Lactation a fortnight, catamenia, and pregnancy.

Confined the 30th June, 1837.

Thus, then, for the first two months after her last confinement she had two distinct actions going on at the same time; and during the eight following months three. If she had carried her child only seven months, we can but take two of the months off and put them to the double action, leaving the remaining six for the triple action. Neither mother nor medical man could tell whether it was a seven or nine months' child, as she was never aware of her pregnancy till a month or two before her confinement. She gave birth to a poor puny boy, very much resembling her last child, and with tendency to hydrocephalus. This was prevented by the simple mechanical application of common soap-plaister strapping round the head, and another strip over it, from the occipital to the frontal bone, which was kept on for nearly two months until it wore off. I have placed the last month, June, as having had one partial action and two distinct actions, the catamenia with pregnancy, because at the very time that the former would have occurred she was confined. It is but fair to suppose that, had she gone by this period of her confinement, she would have menstruated as before.

Case, No. 173.—M. R., aged 35 years, a laundress, and wife of a market-gardener's labourer, married at the age of 33 years, her husband being 21 years old, grey eyes and red hair, short and stout, good character, confined with her first child by me, 7th January, 1840. That day month had her catamenia, which continued regular until April, to the very day, as much so as formerly, and of the same character precisely as before marriage. She is the daughter of a laundress, and has always washed her own linen, and therefore was not likely to be deceived. After April she was not so regular as to the time of her catamenia, but every five weeks until September, when she weaned her child, having nursed it eight months. Was very unwell for a week during the month of August, which led her to think that she

was again pregnant, and this indisposition was her quickening. She had never fainted before this time, but now felt heated and occasionally flushed. These sensations alternated with shiverings, faintings, and sickness.

Not willing, however, to consider these signs of what they really indicated, she thought, as her child was lusty and strong, that they might be from suckling, though she could not help remarking (with the exception of the faintings) that her feelings resembled those of her former quickening. She lost her catamenia after this month, nor did she see any thing of them from September to 24th January, 1841, when she was delivered by me of a very fine boy.

Her state for the thirteen months stands thus:—

January 7th, 1840.—Confined.

February, March, April	Catamenia and lactation.
May, June, July, August, September, October.	Catamenia, lactation, and pregnancy.
November, December, January 24th	Pregnancy alone.

This woman, then, had two actions going on for three months; three, for five months; and during the last four months of her time, pregnancy alone. Her last labour was lingering, but normal. The child was large, the placenta very small, and from first to last the liquor amnii was in the smallest quantity I ever saw, not being more than two or three tablespoonsful. The child was thickly covered with sebaceous matter.

Case, No. 239.—A. B., a lady who has been married seven years, and has been six times *enceinte*, and brought forth at each time a full-grown child; and who, in all probability, would have been *enceinte* for the seventh time, had not her husband's absence abroad for one whole year on his professional duties prevented it. This lady informs me that she menstruates regularly in the first month after her confinement: that she soon afterwards proves pregnant, and is confined again before the end of the year, or soon after; and that she is only prevented by her husband from suckling longer than three months. Her pregnancy and catamenia make no difference as to her power of nursing her child: for, notwithstanding these, she has a fair supply of milk. So that she would continue to suckle if allowed; and probably would do so, if a poor man's wife. Confined by me July 1842 with a daughter, and in September 1843 with twins, a boy and girl; and in December 1844 with a boy—a very clean child—no sebaceous matter—large quantity of liquor amnii.

The following and last case relates to floodings in the early stages of pregnancy, which latter action goes on uninterruptedly even during severe attacks.

Case, No. 304.—M. F., confined 3rd February, 1844, with a girl. A weakly child, unable to suck, from deformity in the mouth. The uvula and upper posterior part of palate deficient. Unless great care is used the principal part of the food comes down the nose. Mother compelled to dry up her milk, which entirely left her at the fourth week.

February 2nd.—Her second child seized with scarlet fever, and died on 2nd March. Her eldest child also seized with scarlet fever, and died on 17th March. On the morning of its death she ran up to my house in great distress of mind, and the day following was seized with flooding, which continued very profuse until the 25th March, from which time she became entirely free, and continued so to the 3rd of May, when flooding came on again, and lasted more or less severely until the 28th June. On

its first coming on she thought it was miscarriage. Felt ill on the 21st July with fainting and sinking. I attended her, and attributed her feelings to the great heat of the weather, but which, in fact, were occasioned by her quickening. On the 3rd August she called on me, saying she suspected she was *enceinte*, as she felt the child quite strongly.

In this case, the ovum and its contents remained uninfluenced by the eight weeks' flooding.

I find, from my Case-book, that I could furnish more cases of *occasional* catamenia with pregnancy, but not with such decided regularity; some partaking of the character of a simple effort of nature to relieve the organ; some occurring once or twice, like true catamenia. Fright or accident will produce similar effects, and floodings, without loss of vitality in the embryo. Amongst the poorer orders I find less immunity from the action of the catamenia during suckling than is generally believed or asserted; and also, very frequently, the double action of pregnancy with suckling.

In the unimpregnated state of the uterus, this organ seems gradually to fill from the last period of menstruation and to become periodically excited, exhibiting a low muscular action which expels its contents. No doubt can exist that, during the time the catamenia is filtering into the cavity, the uterus slightly enlarges, and takes its smallest size when emptied. This action seems to make a gradual trial of the muscular powers of the uterus to expel its excretion, so that the organ may become perfect when called upon to perform the higher duties of utero-gestation and parturition.

Doubts have existed whether the uterus has an internal lining; and these seem to have originated in the difficulty

of detecting a true membrane within the uterus. M. Jobert says, an uterine mucous membrane does exist; and I am inclined to coincide with him, as I cannot imagine an excreting surface to be without one: especially as this surface is called upon to retain that which is excreted until the period arrives for its evacuation. This membrane, therefore, like all other structures, has to be renewed; and its process of renewal may be accomplished, in some cases, without difficulty, and in others with great difficulty. In all cases of dysmenorrhœa, the first catamenia which passes is decidedly membranous. Ihave often examined it; and the only satisfactory conclusion I can come to regarding it is, that the highly-lacerable mucous lining of the uterus gravitates in quantity towards the os tincæ: so that when the catamenial cycle occurs, the uterus has great difficulty in forcing the catamenial fluid through it or the membrane out of its cavity; and hence the pain which ensues in those who suffer from this truly distressing cause. I have seen some patients endure from this more pain than others would from parturition.

I have had occasion to remark a peculiar form of this malady:—that, whereas true dysmenorrhœa occurs at the commencement of the catamenial cycle, and the pains cease after the first twelve hours,—in others no pain has occurred at all at the *commencement* of menstruation, but only in the *last effort*, accompanied with the same phenomena in passing a membranous substance; the previous discharges being perfectly free from it, yet both requiring the same means of relief. This latter form, however, is a considerable modification of the former, though it seems to originate in the same cause.

Nature has also given a law of periodicity to the pregnant uterus: so that philosophy has been able to assign

the term of utero-gestation to be nine months. With respect to these two periods of the uterus, the catamenial and the parturient, differences occur in nature even with a healthy state of the individual; and these differences have led to acrimonious discussions amongst men who would give to their philosophy the narrowest limits, instead of the greatest latitude commensurate with natural phenomena. As the romance of real life frequently surpasses that of fiction, why may not Nature, in her mysterious workings, surpass the philosophy of rules?—and that she does we have ample records.

The catamenial periods are usually reckoned by lunar calculation: according to which a woman should have thirteen of them in the year; the month being twenty-eight days, which, thirteen times told, make 364 days. But how often it happens that some women will be unwell on a certain day in every month throughout the year, which gives them only twelve periods; so that their months will range to thirty days and a fraction of hours. This is not a thing to dispute about, or a fact worthy of any philosophical wrangle: it is a circumstance to be simply admitted; a circumstance so near to calculation, that it confirms periodicity, without bondage to the narrow limits of Metaphysics. But we have very healthy women with three weeks', five weeks', and six weeks' periods; and who would interfere with them so long as they continued healthy, and such a state of things constituted in them an idiosyncrasy? None but those who are ever interfering and giving their own laws to Nature, instead of being content to observe hers.

We have also departures from the philosophical laws of periodicity of parturition. When we meet with the glaring irregularity of miscarriage from debility, we must strengthen the patient's system. If a woman carries her child to the

tenth month, and she is in a healthy state, should we interfere with her? No. It is time enough to act when any departure from a healthy standard affects the patient's system so much as to render art necessary to restore it. Whilst a general healthy state obtains with anormal natural actions, however much they may war against our philosophy, depend upon it that Nature herself is not at fault: she has the means of accommodating one action to another without our interference; and, after all, it is our philosophy alone which is shocked. It is just as reasonable that an extended parturient period should occur, in some individuals, as a normal condition of things, as that others should take five or six weeks to complete their catamenial periods. A woman may marry, and give birth to a child on the 252nd day after, being nine lunar months of 28 days, and have sixteen weeks to complete her year of thirteen lunar months, without a stain on her character. Another may give birth to a healthy child on the 180th day from her marriage; being six lunar months and twelve days, of twenty-eight days to the month, and be quite as spotless in her character, let prudes and evil-minded persons imagine what they may. Again, Nature may take a longer time, in other cases, to complete her work; say, any time between the 252nd and 280th day; bringing it, in the latter case, to ten lunar months. There is no law in nature, that I ever heard of, that forbids such circumstances; and facts prove that they do occur.

These departures from our philosophical deductions, when exceeding largely the usual term of the parturient period, have been subjected to the investigation of legal tribunals. Without reference, however, to these cases, or to the opinions delivered upon them in the courts of law, which have now become matters of history, I will here, by

way of caution, quote the following case from notes most carefully made at the time :—

Case, No. 175.—M. P., ætat. 30. Black hair and eyes; sallow brunette, short, good character, married, wife of a market-gardener. Confined by me with a girl 29th June, 1837; and on 22nd May, 1839, with a boy, which she weaned in November 1839. Has always noticed that three months after each confinement she menstruates, and continues to do so during the whole time of suckling, but never during pregnancy. Had her last catamenia on 10th February, 1840. In the following week she suspected she was *enceinte*, and was confirmed in this opinion by her not being again unwell when her catamenial period arrived. She had also noticed that her former pregnancies occurred about a week after her last poorly time. Her usual symptoms soon took place, of swelled ankles and pain down the legs, which symptoms confirmed her previous surmises. She had also, in this, as in the two former pregnancies, quickened in the third month, which afforded another proof of her real condition, and enabled her to calculate her parturient period, which in the two former cases proved quite correct. About the middle of May, the time at which she quickened, she suffered for some days; and she observed that, this time, the unpleasant symptoms lasted longer. Soon after her quickening, as in the former cases, she gave me notice that my services would be required about the latter end of November, or beginning of December, at the latest. Things went on well, as usual, but to her great surprise did not turn out as she had calculated. I was summoned to her at the beginning of December, and she had regular pains in my presence, as if labour was coming on;—but it did not. I left, though hourly expecting a summons; and I heard no more of her, nor did I see her, until summoned a second time on 26th January, 1841. When I arrived she told me that hers was to be an eleven months' child. She then distinctly and correctly gave me the foregoing particulars, in so clear a manner, that I have no doubt of their accuracy. The last three months of this pregnancy she had had,

to use her own expression, "a thick greenish mattery discharge" from the vagina, which obliged her, for comfort's sake, to wash herself five or six times a-day; and this was not the case during her two former pregnancies, at any time. From the eighth month to the time of her former confinements, her feet and ankles were a source of great annoyance to her from their œdematous swelling and exceeding tenderness, being scarcely able to bear the pressure of her stockings: this same annoyance continued up to the eighth month of the present pregnancy, when the vaginal discharge came on, from which time these unpleasant symptoms entirely left her. Her labour was a very fair one; her pains were short; and I question if the uterine action would of itself have been sufficient to expel the child, without the assistance of the ergot, which was once given in a dose of two scruples of the powder, and not until the patient was getting somewhat low and the pains shorter. The child, a boy, weighed nearly 12 lbs. by the steelyard.

I think this case so clear, that I have not the least hesitation in recording it, or putting implicit faith in my patient's statement of dates and facts. She is an exceedingly clear-headed and intelligent woman, and never deviated from her first account, though I endeavoured to raise doubts in her mind, and hint at improbabilities and impossibilities, after I had heard her narrative. She felt satisfied that she was pregnant on the 24th February, for on that day she first noticed her feet and ankles being tender. Her ceasing to be regular in March confirmed her belief: besides, the œdematous swelling of the feet and ankles was now fully present; and thirdly, having quickened in the two previous pregnancies in the third month, the same symptoms occurred in May. This confirmed her previous surmises: for, at no time, excepting that of quickening, has she ever had such symptoms: these feelings are not easily aped or imitated; and the

woman is not in the least hysterical. Having had them twice before, she is certain she could not mistake the peculiar feelings of quickening. She, no doubt, was pregnant a few days before her ankles became tender; but, as a starting point for our calculation, we will place the commencement of pregnancy on the 24th February; from which day to the 26th January following is a period of 336 days, or 48 weeks, or twelve lunar months, equal to eleven calendar months. The catamenial cycles in this person used to occur, before marriage, about thirteen times in a year in a very regular manner, and, since marriage, every fourth week or 28 days. I am led to believe that the parturient periodicity of the uterus follows the catamenial cycles, forming an individual idiosyncrasy. If, for instance, the catamenial cycles have been very lunarly regular, the parturient period will be regular also, and ten times twenty-eight days be the term from conception to the birth of the child, or 280 days, leaving 85 days, or 12 weeks, to complete the year. This forms a ten lunar-month pregnancy. If the uterus obeys this law of parturient periodicity, Nature may complete her work of embryology, and yet be not inconvenienced by the embryo remaining *in utero* an extra time, until the uterus itself becomes in an active state. If due attention is paid to these uterine laws, we may concede the point, that, when no accident or other cause operates to stimulate the uterus, it may of itself take on the parturient period before nature has completed the work of perfect embryology; as cases frequently occur of women miscarrying several times in succession, at nearly the same period of time.

The great difficulty of getting a good statistical account of the periods of pregnancy, in connexion with the catamenial cycles, originates in the bashfulness of the sex in

speaking or giving correct information on these important points; and probably oftentimes from the absence of that bland manner in the medical man, in making enquiries so necessary towards eliciting these important confessions and arriving at the truth. Questions relating to menstruation are always avoided as much as possible; and the *matrons* are so fond of speaking for the junior parties, who are perfectly able to answer for themselves, that I am often baffled in practical enquiries, and therefore am led to suppose that others are. It is only with a few, in whom the greatest chasteness and modesty with great intelligence and common sense are so beautifully blended, that full information, and that which can be relied on, is to be obtained. Such an individual furnished me with all the information I required of the case I have related above. I am not prepared to say that this is, or is not, of *very* rare occurrence. From my own experience I am inclined to say that women as often go ten as nine months; and that, if a trim reckoning of days could be fairly got at, there would be found a greater number who advance to the full period of 280 days, or ten lunar months, than there are of those who stop at nine.*

* I mentioned this case to a medical friend, who informed me that he was called to a labour, and found everything prepared for the reception of a stranger, and remained with his patient nearly the whole night. Her pains, however, went off; and although he visited her several times during the following day or two, he did not put this woman to bed for nearly two months after. But when he did, the child was immensely large, and he was obliged to destroy it, and bring it away piecemeal. He thinks the child, could it have been weighed in a perfect state, would have been fourteen or fifteen pounds. The patient's vagina ulcerated and sloughed, and he had many weeks of anxious treatment to get her round, though she ultimately did well. He was of opinion that this case was considerably beyond the normal period of utero-gestation, and not unlikely to have been an eleven

The uterus is supplied with arterial blood in greater quantity after it has arrived at maturity, at which time it loses its vegetative character and becomes an active organ, secreting a fluid, and then excreting it. Nor is this catamenial blood influenced by the parent after it is secreted: it cannot be absorbed again into her system, and it can have no other connexion with the parent besides a purely mechanical one. The residuum alone of the arterial blood, from which the catamenial fluid has been formed, is returned to the parent through the uterine veins; and this fact obtains whether the uterus is impregnated or unimpregnated. In the impregnated state of the uterus, that organ only alters in one respect, namely, in the new trial of its muscular powers to sustain and expand with the vegetative growth within it. This increase, however, we must not imagine to be merely an increase of size of the organ: for whilst the uterus is unimpregnated, the supply of blood from its arteries is natural and according to its wants; but when it is impregnated, Nature is too bountiful to overlook the means to fulfil the end: therefore, not only the uterus, but all its vessels, increase in size. Opposite phenomena take place after the act of parturition. The

months' pregnancy. I mentioned my case also to a lady, who called to mind a friend of hers, whose doctor and nurse were summoned, and everything ready, the lady being confident that her time of parturition had arrived. She suffered pains, and the doctor assured her that labour was progressing; it, however, went off: the nurse remained in the house a month, at which time, being engaged to another lady, she left; and the lady was not confined until the second month after her last pains. It cost her her life: the child could not be brought away in time, and collapse ensued in the moment of its birth. The child was very large. These cases may, for aught I know, be on record, or probably in notes, if the practitioners were sufficiently interested in the circumstances. I mention them only by the way—not in any measure authenticating them.

uterus and its vessels again gradually assume their normal standard; but their functions never alter. If it is supposed that the uterus in its impregnated state performs a different set of functions to what it does in its unimpregnated state, then there are no bounds to the speculations of the ingenious; but if its duties are narrowed to certain actions and functions at all times, we have grounds on which to build a firm philosophy.

The uterus, being impregnated, soon exhibits the presence of a foreign body, by becoming enlarged and increasing its angle of obliquity; the fundus getting elongated towards the umbilicus; the os tincæ pointing more towards the sacrum, with its anterior lip somewhat lower than the posterior one; the neck softer, and its inner part, about midway, becoming sealed up by a thickening of its lining membrane, thus preventing an excretory action;—the vagina more vascular, and consequently having a higher degree of temperature and secretory power;—the abdomen becoming more prominent from the pubis; and, in fact, the whole system showing itself actively alive with an increased and universal vigorous vascularity, and every part partaking of an action, which Nature, by her utmost efforts and all her zeal, amply demonstrates is one of all-absorbing interest and care.

Section II.—THE PLACENTA.

We have now to consider the uterus as an impregnated organ: that is, a foreign substance, which it did not before possess, has found ingress to it, and the periodical excretion is suppressed. In what stage, then, did this foreign substance find the secretions of the uterus so that it arrested their further discharge? For it not only causes their retention, but appropriates them to another purpose; so acts on them as to change their entire character, and, by the aid of certain vital actions assisting the chemical forces of two opposite elements, a third power, mightier than either, becomes existent. Whatever the germ or foreign body contains, it is pretty certain that it would remain *in statu quo*, if no other element were present to assist its growth. The uterus cannot assist it, for that organ, we have already seen, does neither more nor less than it did before impregnation took place. It is a mere receptacle or bed for the germ to increase in. Its secretion alone appears to be appropriated by the increasing powers set up. These soon assume a character we know by the name of placental. The vegetative distinction is clearly shown: the flower must blow, and the pod must form, ere the seed can grow within it. In the first six weeks or more the placenta is considerably larger than the embryo: the former a bulky organized mass, the latter a mere speck; but as time wears on this speck becomes the most important object, and the placenta comparatively smaller but more organized: both, however, preserve their distinc-

tive characters. The first duty Nature had in view was to form a placenta or organ of a temporary character to lodge the embryo; and next, to endow this organ with certain functions. It seems evident, then, that the placenta makes use of the catamenial fluid, and that this fluid must empty itself within the decidua, as both fœtus and placenta are within the decidua in one body, called the ovum. The placenta, now become an organ, performs similar duties for the embryo to those which the parent performs for the womb. The organization of the parent renders the circulation of the blood a complete material for the supply of the womb: the placenta, through the agency of its new powers, requires only a regular supply of catamenial fluid for its great laboratory, to convert this into materials fit for the formation of all the organisms of the embryo, as well as for the preservation of its own integrity. We cannot imagine that the results of new powers, new chemical forces, new vital actions set up in a new vegetative existence, are to find a passage into a system having already sufficient duties to perform. What would be the result of such a state of things if a residual mass, such as may be supposed to be made during the formation of a new being, were to find a way into the parent's system? We cannot admit of absorption or re-absorption of the catamenial fluid: neither can we admit the absorption of the residua from the ovum. Some bounds must be set to probability as well as possibility, in the absence of *bonâ fide* evidence or ocular demonstration. The germ must have carried with it an active agent, which feeds on and consumes the catamenial fluid constantly generated, furnishing thereby powers, to be used according to the laws of the chemical and vital forces of such agent. Whatever may be the theory of impregnation, it is a fact that it does

take place, and that the germ obeys its own laws of increase. If no adverse cause impedes, diverts, or alters this supply from its natural and healthy course, the germ becomes the ovum: but if natural causes alter or disturb the integrity of the chemical forces engaged in the vital action of the whole or part, either in the germ or catamenial fluid, the ovum then becomes blighted, though it does not immediately lose its vitality. Its death, however, is necessarily sure, though slow.

The connexion between the uterus and the ovum is of such a character, that an immediate separation between them would endanger the life of the parent. The consequence is, that a blighted ovum may remain *in utero* from a fortnight to six months, and more. The ovum may be blighted either totally or partially; totally, when the placenta and embryo are both affected. In this stage, the ovum has to wait till the disunion between it and the uterus has taken place—a wise provision of Nature. When this is effected the difficulty is soon got over; for though, before the blight, it has only been a body in connexion with the uterus, it is, after its blight and complete death, a foreign body unconnected with it. When this has thoroughly ensued, Nature, too cautious and too wise to permit the presence of such a body, soon rejects it; and she does this for several reasons: the two principal of which are, that it interferes, in the first place, with the return of the previous functions of the containing organ, the uterus; and secondly, that, being of no further use, the sooner it is discarded the better. Next, the ovum may be partially blighted:—this occurs when the embryotic existence within it is entirely destroyed, whilst the placental portion is not. In this state the placenta keeps increasing in size, as if unaware of its ultimate uses being

at an end; namely, to nourish a fœtus. Arriving at a certain stage, however, it finds its labours useless, and it gradually ceases its efforts;—perfect though it may be in itself, it can only arrive at a prescribed point of usefulness. When the supply of catamenial fluid from the uterus is unable any longer to be appropriated, it gradually lessens, until, at last, it stops altogether: after which time the ovum becomes as foreign a body as when totally blighted, and the same laws for its expulsion begin to operate.

The difference between the two phenomena is this,—that the *totally* blighted ovum is ejected in a period varying from one to five weeks, more or less; whereas the *partially* blighted ovum is ejected in from one to six months, more or less. I have seen many cases where the size of the patient has gradually increased to the fourth month, and after that period a gradual decrease has ensued till the sixth month, when the ovum has come away. On examination of it, there has been scarcely a trace of the embryo; and in all that I have seen it has appeared like a small bluish-grey pellicle attached to the placenta, which, when broken, has contained a fluid with a small white speck: whilst the placenta has been so far perfect, wanting only those characters which denote the placenta after a full period of utero-gestation; *viz.* the large,well-developed, and full vessels, the membranes of the chorion, amnion, &c. A *totally* blighted ovum is firm and small, and comes away without much difficulty or flooding; a *partially* blighted ovum is more or less attended with uterine or labour pains and flooding. Considerable annoyance, however, may be experienced in both cases; but this always depends on the partial or total disunion between the foreign body and the uterus at the time of its ejection.

A double ovum may become blighted either wholly or

partially, and an interval elapse between the expulsion; or a double conception occur, in which one child will live to maturity, and the other be blighted in the ovum. In my obstetric Case-book I find:—

Case, No. 76.—E. G. alias S., ætat. 27 years; a pretty brunette, dark hair and eyes, tall; character, qu.; single. Her fourth pregnancy, all terminating in miscarriage. Ovum partially blighted between the fourth and sixth week, which she carried on till the fourteenth week. The first was expelled 16th October, 1838; a second expelled 18th October—two days after:—so that, had she gone her full time, she would have had twins—or a single child and a single ovum—as occurred in

Case, No. 69.—J. S., ætat. 29. Light-brown hair and eyes, middle stature, character good, married, had had two boys and a girl and one miscarriage, no twins. Confined 31st October, 1838, 10½ A.M. male child: placenta perfect. Two hours after confinement had a sudden flooding and sinking. On being sent for, I found she had just passed a large flat blighted ovum, larger than the placenta of the child. She did well.

Case, No. 287.—F. O., ætat. 22 years. Dark hair and eyes, short, married, first child, confined 23d September, 1843, 4½ A.M. male child. Uterus large, after secundines were removed, which were perfect. Did not go on favourably for two days. On 26th, forty-eight hours after the accouchement, the nurse showed me a blighted ovum passed in the morning of the second day, which was quite firm and flattened.

In both these cases one ovum must have been entirely blighted, but could not come away on account of Nature's integrity of purpose towards the living ovum: that was now all her care. It shows that, in both cases, she had long since stopped all communication between the two bodies, the living and the dead; whilst sufficient vitality had been preserved in the blighted ovum to prevent that putrefaction

which would have affected, and perhaps destroyed, the vitality of its fellow-embryo.

The placenta has long been considered by physiologists to be the lungs of the fœtus: let us not disturb this doctrine, but reason on its uses as a temporary laboratory to effect a great change in the catamenial fluid, by converting a non-nitrogenized into a nitrogenized blood—which blood is no longer catamenial; and, if catamenial, can be of no specific use until it is altered: but when it is changed, we presume that it should have all the characteristics of arterial blood, and possess the same elements as the arterial blood of the parent, either to make new organisms, supply waste, or repair injuries. We can then imagine that it is an element which, if duly and regularly made and supplied, will begin and perfect a being or animal in all its parts, according to the species of its parents. It is the paramount duty of Nature to perfect its machinery before that machinery can make a fabric, and anxiously watch over it during the performance of its task. Here, then, are assigned functions to an entirely new organ, the placenta, made to continue for a certain time only and for a specific purpose; powerful in maintaining its own laws in their integrity, but powerless in altering them. Men may suggest new theories, but must certainly err, when they make it appear that a certain function or duty is performed at one time, and another at another time, by the same organ. This surely, to say the least of it, is unwise. The opinions of men may alter, but the great laws of Nature were, are, and ever will be the same, from the time of their foundation until now, and from now to eternity.

The placenta can have but one duty to perform, which is, to receive fluids, and alter, modify, and change them,

for the end in view. We find this newly-formed organ devoid of lacteals, absorbents, and nerves ; connected only to the uterus in the most superficial manner, just sufficient, in fact, to receive from that organ its secretion ; and, therefore, there can exist no nervous apparatus between them. The placenta seems to be but a simple organ formed for sanguineous changes. In one respect the placenta is to the embryo what the mother is to the uterus: it furnishes the blood for its growth; receives from it a residuum; reconverts that; and even provides a place for effete matter. If effete matter from the fœtus finds its way into the placenta, the placenta must be in a condition to receive it, and must appropriate a place for it: such matter cannot mix or assimilate in any way with the residua which are to be used again : if it did, it would considerably interfere with the duties of the placenta. Certain it is that the uterus does not react on its secretion, the catamenia, therefore it cannot act on the new organ, the placenta, or have any influence over its functions ; particularly as philosophy has shown the absence of those powers whereby alone it could exert any influence. If the uterine functions are limited to such duties as we have described, the placenta has also its prescribed tasks. The duties assigned to it as a separate organ, of limited action, duration, and existence, may be defined to be such as are peculiar only to itself, and are unconnected with the uterus, or fœtus, though it is an intermediate organ between the two. If this organ performs a duty for the blood, previous to that blood going to the fœtus, like that which the lungs of the parent perform for the undecarbonized blood (or blood which is the union of the result of new matter from flesh aliment and the venous residua), philosophy has then properly styled it the lungs of the fœtus. It must, in that case,

receive new ingesta, or the catamenial blood from the uterus, and residua from the fœtus; but if it has an assigned place within it for effete matter from the fœtus, it must provide accordingly, so that none of that effete matter shall mix with the sanguineous residua which is to be used again. I am not disposed to think that any fresh change occurs in effete matter or excrement wherever it may be deposited, either in the fœtal state or afterwards, so as to render it available as a nourishing matter. No such circumstance or probability is admitted throughout organized matter either vegetable or animal; and, indeed, any such suggestion would oppose all the laws of Nature. In the formation and perfection of the embryo, effete matter must be deposited; and, as far as I have been able to inform myself as to the function of these depositaries, I find that the placenta receives one excrement only from the fœtus—the urine. It is probable that the urine, as a fluid excrement, may be deposited in the placenta; but it is very improbable that any solid excrement from the fœtus is deposited within that new organ. It is, indeed, utterly improbable that any such effete matter should find its way out of the fœtus through the placenta, thence to the uterus, and on to the parent. Where are the vessels and apparatus situated which are to perform such duties? There are no lacteals, absorbents, lymphatics, glands or nerves in the funis or placenta. Physiologists, in order to carry out their views of the probability of such actions, have endowed the placenta with probable vessels for the purpose; but probable vessels will not serve our turn, nor Nature's—neither.

Again:—even supposing that the placenta had such a connexion with the uterus, how could parturition take place when all this connexion must be broken through and destroyed for ever? And what a confusion would

arise in the parent's system, supposing all the necessary vessels came from the uterus to the placenta and fœtus, to connect these new bodies with the parent! To believe in many physiological doctrines at present received as truths in regard to the uterus, placenta, and fœtus, this complicated union must be admitted; and, if so, would or could parturition ever take place in such a state of things? As well might we suppose that the whole uterus and its appendages could be detached and come away from the parent, as parturition take place under such complicated, such inexplicable circumstances. Nature's machinery, though apparently complex and involved, is nevertheless simple—often, indeed, too simple for man's great mind—and acts by very simple laws, in very regular order, arranged in a consecutive chain of causes and effects, all ordered and foreseen, from the first link to the last, in a way which is more wise, effective, and complete than any of the boasted works of man.

The functions of the placenta appear to be, firstly, a creative action—otherwise, to form itself; and in its perfecting process to aid the fœtus. Afterwards, to convert a non-nitrogenized into a nitrogenized fluid; a catamenial into a placental blood, corresponding with, though not perhaps perfectly analogous to, the arterial blood of the parent, by whom the catamenial blood is made. This placental blood passes by the umbilical cord into the fœtus, through what is called the umbilical vein, but which might with more propriety be called the PLACENTAL ARTERY. As from this blood the fœtus is formed, it cannot be supposed that organs, and parts of organs, and all the attributes of a new being are formed out of venous or undecarbonized blood. As well might we suppose our own organs to be renewed and repaired by venous or unde-

carbonized blood, when every theory we have accounting for the repair of waste or injury says that this is effected through the agency of carbonized, or nitrogenized, or arterial blood. We should at least be consistent, and assign similar duties to similar agents, not similar duties to dissimilar agents, as must be the case if the umbilical vein carries venous blood. But if we say the umbilical vein conveys arterial blood, why not raise the passage to the dignity of an artery, when a term so appropriate as PLACENTAL can be given to it? The excess of blood from the fœtus is brought back by two umbilical arteries, or, more properly speaking, UMBILICO-FŒTAL arteries. This cannot be called a residuum, but rather an excess of arterial blood, which the fœtus has no means of appropriating: it, therefore, gets again into the placenta through its own proper channels, mixes with the catamenial blood in the placenta, and again finds its way through the placental artery. As every day brings with it a higher degree of organization and function of the placenta, whatever may be the character of the placental arterial blood at first, there can be little doubt of its becoming more highly organized towards the later period of gestation, from the mere fact of the higher-organized state of the fœtus itself, and the greater quantity of arterial blood passing out from it into the placenta through the umbilico-fœtal arteries:—for these two arteries are the continuation of the external iliac arteries of the fœtus itself. And we cannot for a moment suppose that the iliac arteries of the fœtus, more than the iliac arteries of the adult, carry anything but arterial blood. Fœtal-arterial blood does, however, differ from the arterial blood of the adult, and resembles catamenial blood in this respect—that it does not coagulate. I have now in my possession about two drachms of fœtal

blood, taken from the descending aorta of a four-months old fœtus, perfectly fluid and unchanged in colour or appearance, though two years have elapsed since this specimen was obtained. This long-lasting fluidity is, no doubt, ordained for some wise end, out of my power to understand. I am inclined to believe, however, that the first few respirations of a new-born infant—the first effort it makes with its lungs, by absorbing oxygen from the air, soon converts the whole mass of its fœtal-arterial blood into a more highly decarbonized and nitrogenized constituent for all the purposes for which that important element is destined. This does not nullify the supposition that the blood in the arteries of the fœtus is not arterial. Sufficient oxygen can be present in the arterial blood of the fœtus to endow it with the rank of arterial blood, whilst the excess of oxygen on the first inspiration may complete the action to the standard of the arterial blood of the adult.

I have already alluded to one important duty which I conceive the placenta to possess—that of assigning a place within it, or in its membranes, for the reception of effete or excrementitious matter from the fœtus,—namely, the urine, which passes through the urachus. The urinary bladder in the fœtus is oblong, and resembles a long gooseberry, the fundus elongated to the urachus, which passes upwards between the two umbilico-iliac arteries into the funis. This urachus, in a fœtus of four months, I traced several inches up the chord with a common silver blowpipe, and I have every reason to suppose and believe that this passage is open into the placenta. In the kitten and puppy the urachus appears to me to contain more urine, from the fundus of the bladder to some distance up the funis, than in the small oblong bladder itself. In the fœtal calf it has been fully established as being an open tube,

carrying the urine to the allantoid membrane. Physiologists have considered that, in man, it terminates in the chord; but this I do not for a moment believe: they may not have been able to trace it beyond a certain distance in the chord, where, probably, from its terminating in an almost capillary apparatus, it has been considered not to have gone farther. In the absence of a subject to experimentalize upon, I have not injected the urachus, to ascertain positively the fact of its permeating the placenta, though I suspect that it does, and that the urine which passes through it is provided with a situation in that body. Bidloo is the only author who maintains the same opinion, and believes that the excess of urine of the fœtus has its place between the chorion and amnion. Of the presence of a fluid in this situation I have never doubted, from the following facts. A female will often discharge large quantities of fluid during the latter months of utero-gestation, whilst the amnion is perfect at the time of parturition. This has frequently occurred in my practice, and I speak of it on this authority alone.

In many instances well known to obstetricians, a labour may be what is called a dry labour: that is to say, during its progress there is scarcely any moisture in the vagina even when the membranes have protruded as large as the fist. The presence of a fluid between the chorion and the amnion I have frequently detected by carefully rupturing the one with the finger-nail, and peeling it off during the progress of pain in a dry labour. The fluid which followed immediately in consequence was sufficient to lubricate the vaginal passage; and the drip, which was considerable, has certainly been devoid of the urinary smell. This does not oppose the supposition that it is the urine of the embryo, because in the first urine that is made this fact, *viz.*, the

absence of the urinary smell, is apparent. When I have succeeded in rupturing the chorion without the amnion, I have also found the latter membrane tough, so that it has protruded from the external passage a full, tense bladder, as large as an egg, without breaking; and during the absence of pain I have frequently tried to pinch it between my finger and thumb with the intention of breaking it, but have not succeeded. Does the presence, then, of the urine between the chorion and amnion harden the latter? I am inclined to think that it does. I attended a case on 4th November, 1844, which was a dry and lingering labour. The chorion became ruptured, and a discharge ensued which materially aided the progress of the labour by lubricating the vaginal passage. As far as I could reach with the finger I could force back the chorion, and at last left the amnion quite smooth and exceedingly tense over the head of the child. The amnion was not ruptured until the head was protruding through the external passage, and but a small quantity of liquor amnii escaped. The child was not a large one, but when born was covered with a fair proportion of sebaceous matter, especially over the face and neck. Its mouth was full of a slimy mucus which I was obliged to remove: it caused a gurgling and guttural sound to its breathing and cries. This fact I have frequently observed. The mucus resembles that which is found in the stomachs of still-born children. The amnion and chorion, in some cases, are so lacerable, that the first effort of parturition will break them, and labour come on quickly; or the liquor amnii will continue to flow for several days before the birth of the child.

The duties of the placenta also include the formation and growth of membranes. Within the body of this new organ, and external to the placental and umbilico-fœtal

arteries, is the chorion, in connexion with and enveloping the inner part of the placenta itself and its vessels, which in its reflections resembles the peritoneum, forming a *cul-de-sac:* (this may with propriety be called the proper internal covering of the placenta:) whilst the amnion, or inner membrane, appears to arise from the base of the placental vessels at their union to form the chord as soon as it becomes single: thus not deterring the growth or extension of the chord within it, but forming a covering of the chord, and, consequently, a continuation of the amniotic membrane as far as the umbilicus of the child, at the same time that it is the proper membranous bag for the liquor amnii and the embryo. From the point of union of the placental vessels to form the umbilical chord, and the commencement of the amnion from this point, as well as the simple chord, the liquor amnii and fœtus, the whole apparatus belongs to the physiology of the fœtus. All the other parts, such as the body of the placenta, its vessels, the chorion within, and any fluid between the chorion and amnion, and the deciduous membranes external to the placenta, belong to the physiology of the placenta.

As the uterus dilates with the growth of the ovum, the placenta is the only part in contact with it. The one seems to accommodate itself to the other. The external shape of the uterus, as far as we can judge of the abdominal appearance of the mother, is by no means symmetrical or regular in its form, either as a general law, or as peculiar to those who have borne children. The position of the child, and other causes, tend to disturb this uniformity. We see an unerring correctness in the disposition of Nature to meet these circumstances. If, as I have before hinted, the fact is not borne out that the deciduous membrane embraces the orifice for the collection of the

catamenia during pregnancy, for the use of the placenta, the placenta must be so situated with respect to the uterus as to insure its supply; and all parts of that new organ must be in apposition to such parts of the interior of the uterus as exude the catamenial fluid. The spongy and soft state of the external part of the placenta forms an admirable cushion to the interior of the uterus, and is well fitted to receive the oozing moisture, even when in large quantities.

When we consider the beautiful order of a natural labour, and the mechanical action of the placenta, after the birth of the child, in smoothing all the internal uterine surfaces as the uterus contracts upon it, we behold nothing but wisdom and an unerring law. Thus, soon after the birth of the infant, we use gentle traction to the chord as the uterus contracts: the placenta becomes inverted; the inner side of the amnion, which contained the child, becomes opposed to the internal surface of the uterus; and that which was before opposed to it is now within the membranes: the gentle means used in bringing it away smears, as it were, the whole internal surface; whilst all the orifices, which before were acting and exuding copiously, now perform that duty faintly; and what comes away, at first, is of a sanguineous character, but soon subsides into the form of the lochia. The large quantity of blood previously sent to the uterus now fills the abdominal arteries, which, freely anastomosing with the mammary arteries, determines to those glands formed for the secretion of milk. There can be no difference of opinion amongst practical men as to the benefit it is to a parturient woman to suckle her own child. It is one of the great sources of relief to the uterus, and consequently one of the great preventive causes of

diseases which arise out of the want of integrity of that organ, either from over exertion or excitement. But if, from fashion, or false notions, the higher orders of the human female pass their children over to wet nurses, in lieu of suckling them themselves, and they have children quickly as a sequence to this practice, sooner or later, diseases of various kinds attack their systems. Some, no doubt, may do and have done this with impunity; but it is no rule that all should. Let us hope that there are ladies who have minds reasonable enough to bear to be told of the consequences of not nursing their children, and of using artificial means to dry up their milk, at all times a hurtful process, as it is at direct war with a natural and healthy action. These remarks are intended only for the healthy parent, capable of nursing; not for her who from some untoward circumstances is unable to do so, and where, on the contrary, it is absolutely necessary that she should not nurse her child.

We find that the duties of the placenta are thus limited, first, to organizing itself and rendering itself distinct both as regards the uterus and the embryo, preserving its own integrity, and yet being, all the while, the medium of communication between both. It is evident that the uterus has its own assigned duties, whether it be impregnated or unimpregnated, and is only mechanically altered in size during the impregnated state. The secretion which the placenta receives from the uterus is very different from that which it transmits to the fœtus. When the parturient period arrives and the child is expelled, the duties of this new organ, the placenta, cease as a matter of course, and it immediately becomes a foreign body; and though, as we have regarded it, a highly-organized body, to effect a san-

guineous change, in the absence of nerves, lymphatics or absorbents, it is important that it be removed as early as possible, consistent with sound practical experience. The uterus, in due time, recovers its former shape and size, and remains unaltered in its functions.

Section III.—THE EMBRYO.

We have now to consider the germ or embryo as a distinct body, increasing by its own laws, using its own powers, and itself appropriating the placental fluid which has been changed by the functions of the placenta from the catamenial, or from a non-nitrogenized to a nitrogenized element. All its organs and parts now assume various shapes and substances, in the deposition and formation of which residua are thrown off, which also aid and assist in serving some great end; and the effete matters are deposited in their appointed places, where they cannot act deleteriously on either the parent or placenta, or the embryo itself, but are made to serve a useful and mechanical purpose. No residua of the placenta or effete matter of the embryo return to the parent; both are cared for, the one by proper appropriation, the other by careful deposition, as the case may be, by each, either separately or collectively.

It has been shown by Professor Liebig, that the same laws regulate the life of the seed of a plant as the ovum of an animal, and that the seed contains all the primary elements of vitality, the nitrogenized portions. At first, when the seed is planted, its animalized portions require a full saturation of the alkaline properties of the humus or ground; so much so, that the radicle leaves of plants after incineration are found more abundant in alkalies than the later leaves: after which the nitrogenized constituents are again in excess throughout the plant. It appears, there-

fore, that the sustaining vitality of the seed, until it is placed in the ground to germinate, consists in retaining its animalized or nitrogenized properties in full integrity. If Nature is so bountiful to the seeds of its vegetable kingdom, does she overlook the young animal in its vegetative or fœtal life, or its early stage of self-existence? The fœtal life of animals is no more than vegetative, and scarcely more than this for a given time after birth. Nor has Nature been less bountiful to man than to the lower animals, and the seeds of plants. As she seems to work by similarity of laws, man exhibits a combination of all the phenomena of vegetable and animal existence as necessary to his growth and perfection as the paragon of creation.

"So man, at first a drop, dilates with heat;
Then formed, the little heart begins to beat."

We find the fœtus connected to the placenta by the umbilical chord. A passage through this chord from the placenta transmits arterial blood to the fœtus. The laws of the changes of this blood on arriving at certain parts so as to form bones, muscles, cartilages, nerves, and all the various tissues necessary to the development of the future being and to its completion, are precisely in the same relation to it as the arterial blood of the parent is to the parent itself. Nature uses it in the parent for the supply of waste, or the repair of injury. In the fœtus it serves to construct all parts, and then to sustain them. After a certain time the various blood-vessels commence their functions with a greater or less degree of activity; the other vessels, such as the lymphatics, lacteals, absorbents, &c., perform their several duties, until we perceive daily a gradual increase of mass in the embryo. But what are the duties of these vessels, unless they are such as we assign

to them in the adult? We must or must not admit their action in the embryo. If they do not act in the embryo, how can it be ascertained that they will act properly when called upon to do so at the birth? Physiologists cannot, therefore, be wrong when they state that the organs of the fœtus have limited actions. These, in their due course of development, assume a passive action, bearing some similarity to the active one they are hereafter destined to perform. Towards the termination of utero-gestation these become more active. It is not probable that their active duties should commence only with a self-existence, that is, after the birth of the animal.

The very period when all these organs are found capable of performing their duties with integrity is the time chosen by Nature to expel her great work. How is she able to discover that the organs of the fœtus are in a perfect state unless she has tried them? We cannot imagine a mechanic turning out a piece of mechanism from his workshop before he has tested its powers and tried and regulated them, so that when it is in the hands of another it will be found true in all its movements. Is Nature less wise than the mechanician?

It is manifest that the organs begin to act as soon as they are able to act; and that in this operation they secrete, and thesesecretions are appropriated to certain uses. These secretions must, therefore, be used again in the economy of the embryo, in the same manner as in the being after birth, as there is no other exit for them but into the fœtal body itself. The organs which secrete substances not to be used again, to which the term excretory is given, also eliminate their contents. How far, then, do the secretions of the organs of the fœtus itself contribute to its own development? What does it retain in itself for its

own uses; and what passes from it to the placenta, to mix with the new product which that organ is continually forming from the catamenial blood? In other words, what excretions, in the form of effete matter, does the fœtus keep in its own system, and what excretions pass out of it? And does Nature make use of them mechanically, or otherwise? We cannot imagine that those organs which we call excretory do not act, or that they do not expel their excrements. If we do not understand their laws, we cannot deny their functions. The deposition of excrement in the fœtal system must therefore be so situated, and so guarded against, that it shall not be injurious, and liable to be absorbed into the fœtal system.

The placental or real arterial blood, for the use, formation, and nourishment of the fœtus, passes through the umbilical chord into the fœtal liver: there is no doubt as to this fact. At the points of termination of all the fœtal arteries deriving their currents from this source capillary attraction, with its certain alteration in the blood, must take place, and venous blood be the result, which blood must be retained in the system of the fœtus precisely as it is in the same being after birth.

Whether this blood undergoes perfect decarbonization, in the absence of the function of the lungs, we cannot say; but this we know, that, wherever fluid exists, oxygen must be present; and as venous or residuary blood must be made, a low state of oxidation must ensue. And this we know also, that a portion of the venous blood from the intestines goes into the vena portæ for the use of the liver. and for the secretion of bile; and another portion, from the upper and lower extremities, goes into the vena cava, and thence into the right auricle of the heart, where it mixes with the arterial blood of the placental artery, or, as it is

now called, the umbilical vein. Therefore it follows that the organs of the fœtus act even during their own formation; and when they are perfectly formed they act vigorously. We must admit, then, that the organs of the fœtus very soon begin acting, first partially, and afterwards wholly; for, without these actions, secretions could not take place, and bile could not be formed, which is a product of venous blood, the residua of that blood which went to form and nourish the abdominal viscera. Neither, without these admitted actions, could the meconium or effete matter be formed, which is the result of the functional actions of the fœtal organism.

Not only is fæcal matter cast off so as not to act deleteriously on the embryotic system, but it is made subservient to other uses. We may justly ask what those uses are, and what condition the bowels would be in without the presence of the meconium? The answer is simple. We have inferred that all organs are tried and perfected in their actions previous to the state of self-existence of the animal. As gradually, then, as the organs act, so gradually is the alimentary tube from the stomach to the anus made capable of containing foreign substances. The alimentary canal is made the depositary of effete matter, which effete matter serves to expand and keep open this tortuous canal. A soft unctuous substance like the meconium is, of all things, the most proper stuffing, if I may use the phrase, to dilate the intestines and keep them open, until that time when the being is called into self-existence. The intestines are, therefore, the depositaries of effete matter, while the effete matter serves to keep them tubular; and this action of the meconium is simply mechanical. The kidneys must also act, and in their action secrete urine, at a very early stage; consequently the ureters are made to

perform their duties, and the bladder becomes the recipient of the urine or effete matter of the organic and functional action of the kidneys. I have seen in the fœtus the bladder full, and containing, by measure, between five and six drachms of urine at the early period of four months. Supposing, then, that the kidneys continued as active during the ensuing five months, it would be impossible that the bladder could contain the quantity of urine eliminated, unless some provision were made by Nature to remove it from this viscus. There can be no doubt whatever that the kidneys secrete urine at a very early stage of embryotic life, and that the bladder receives it as its natural depositary; that this urine, like the meconium in its mere mechanical duty, serves to keep the bladder open; and that when the bladder becomes full it passes through the urachus, or via urinaria, to its destined place amongst the membranes of the placenta, where it is prevented from being injurious to that organ and its functions, or to the embryo itself, from any absorption of this effete matter.

The third excrementitious or effete matter to be provided for is that which must necessarily arise from the whole surface of the skin. It cannot be doubted that the perfection of that organ in a great measure depends on the powers of excretion. So large a surface, having a capillary termination within it, should have free exudation. Its pores should be kept constantly open: its cellular membranous glands constantly and freely in action, and the gradually expanding surface be unimpeded, as all growth appears to be from within. It does not appear that the skin of the fœtus can absorb; and the reason why is simply this, that there is little or nothing to be absorbed, if we except the small quantity of free oxygen generated in the liquor amnii. The question then arises, what is the liquor amnii?

Is it the aggregation of the perspirable or exuding matter of the fœtus? It is an excrement, without doubt, probably made subservient to uses of a merely mechanical character; and the quantity seems to depend on the good or bad condition of health of the fœtus. There is no statistical guide for my observations, but I have always fancied the plumpness and fineness of the child to be in proportion to the quantity of liquor amnii, and that the skin is also clearer and finer. Experience has long led me to couple the fact of poor, thin, small children with a scanty quantity of liquor amnii; and I cannot call to mind a single case of a small, puny child with a large normal quantity of liquor amnii; excepting always cases in which there is a diseased structure in the embryo, which may be small, and in such cases an extra quantity of this fluid being present, far exceeding the normal standard, at once shows a diseased condition. Such a case, for instance, is the following, for which I am indebted to my brother. I saw this child myself the day after its birth.

Case of Spina Bifida in an infant, with an anormal quantity of liquor amnii at its birth, by J. J. Ridge, *Surgeon, Gravesend.*

A. B., aged 34 years, has had five or six children; has always enjoyed good health, and never experienced any anormal condition of her children before this. Confined September 1844 at her full time. Labour natural; a very small *female child,* not larger than a six months' fœtus; liquor amnii *most abundant;* placenta small, trifling hæmorrhage afterwards. Extending over the twelfth dorsal vertebra and the sacrum, there was a sanguineous bag, raised about an inch from the level of the back, which pulsated regularly for some hours after its birth, when it gradually sunk, and the skin over it became shrivelled and broken, and the blood within coagulated. Child died within forty-eight hours after birth.

Sectio cadaveris.—The external covering of the sanguineous bag appeared to be connected by a free margin to the cuticle, but which was itself the cutis vera: for, although the cavity on opening it was in direct communication up the vertebral canal, it was not the posterior sheath of the medulla spinalis, for that appeared wanting; although there were very distinct though small nerves proceeding through the vertebral foramina. The blood evidently circulated in the sac, and no doubt was from a continuation of the arteria vertebrata. The bodies of the lumbar vertebræ were normal; the posterior parts of the arches or rings being wanting. The dorsal vertebræ were also normal, the brain healthy; the medulla small down the lumbar region. The viscera were all perfect and *in situ*, and of normal size, excepting *the bladder, which was very large*, as also the external meatus: a probe passed very readily through it into that viscus. Notwithstanding the bladder was anormally large, the kidneys appeared to be of the ordinary magnitude, in comparison with the other organs, though it must be admitted they probably acted over-diligently, and, from the quantity of urine supplied, caused an increased size of the bladder. There was deformity of the knee-joints, particularly the right, which was partially dislocated posteriorly.*

The largest amount of liquor amnii I ever remember to have witnessed, with one of the finest of children, I find, in my obstetric Note-book, occurred with

Case, No. 111.—M. T., aged 35 years, dark hair and eyes, tall, good character, married, confined 29th July, 1839, 4½ A.M., lingering labour, male child, full time. Had previously had three boys and two girls; no miscarriage or twins. Assisted labour with the secale, and the use of the sheet round the body; dry

* I am inclined to offer the opinion founded on my previous remarks, that a portion of this suspected liquor amnii which was so abundant was in fact *fœtal urine*, which had been deposited between the chorion and amnion during the later months of utero-gestation.—R. R.

labour—head presentation—the membranes not ruptured until the head was born: no liquor amnii escaped then; but the moment the shoulders were born the child came forcibly into my hands, with at least three or four quarts of liquor amnii, which the sudden contraction of the uterus sent several feet beyond me; and the quantity, which I could only judge of, flooded the part of the room on my side of the bed, where it was so suddenly thrown that I seemed to stand in a pool of water. This individual fully expected twins, from her great size.

Where there is a large fine child and a small quantity of liquor amnii, the child is generally covered with a variable quantity of sebaceous matter. It has been thought that this sebaceous matter is a deposit from the liquor amnii: I cannot at all agree to this opinion. From carefully perusing the analysis, by experienced chemists, of the liquor amnii, there appears to me to be nothing in common with this fluid and the sebaceous matter; both seem to be the result of cuticular excretion.

In my own case above recorded the child was large and clean, with not a particle of sebaceous matter upon it, which the large quantity of liquor amnii should have generated, if it is a deposit from this fluid. In the absence of any other and better theory of the formation of the liquor amnii and sebaceous matter adherent to the surface of the child, I am inclined to the belief that both are exudations from the cuticular surface of the embryo. Everything seems to favour a radiation or exhalation from the centre to the surface; and there seems no support to the argument that anything is absorbed by the cuticular surface of the embryo, or taken by it into its system, excepting through the umbilicus from the placenta. And it is most improbable that, if the liquor amnii and sebaceous matter are excrementitious, these should find a passage into the

embryo again. The very meaning of 'excrementitious' implies something which has inevitably passed out or away from a system, and is incapable of being converted by any means to any useful purposes for the same animal again.

With regard to the excrementitious substances which remain in the tubular cavities of the fœtus until its birth as deposits for a mechanical purpose, I find the following observations in Dr. James Blundell's 'Principles and Practice of Obstetricy:'—

"In the fœtus, the stomach is not unfrequently empty, or nearly so; and when it does contain anything, if I may judge from some two or three observations, this consists of a mucous secretion mixed with the gastric juice."

"Notwithstanding the high authority of Boerhaave, it cannot be admitted that the fœtus continually swallows the water of the amnion, and digests it for its nourishment. The stomach, indeed, contains a viscid matter in considerable quantity; but it has no resemblance to the liquor amnii: *it is very acid and gelatinous;* towards the pylorus it is somewhat gray and opaque: it appears to be converted into chyme in the stomach, in order to pass into the small intestine, where after having been acted *upon by the bile, and perhaps by the pancreatic juice,* it furnishes a peculiar chyle. The remainder descends afterwards into the large intestines, where it forms the meconium, which is evidently the result of digestion during gestation. Whence does the digested matter come? It is probably secreted by the stomach itself, or descends from the œsophagus: there is nothing, however, to prevent the fœtus *from swallowing, in certain cases,* a few mouthfuls of the liquor amnii; and this seems to be proved by *certain hairs,* like those of the skin, being found in the meconium. *It is important to remark that the meconium contains very little azote.* Nothing is yet known regarding the use of the digestion of the fœtus: it

is probably not essential to its growth, since infants have been born without a stomach, or anything similar."*

I find the following Case, No. 58, in my Case-book:—

—— G., age unknown: red hair and dark eyes; tall, married, confined 16th August, 1838, 9¼ P.M., full time, female child: normal labour. Child vomited a limpid milky fluid directly it was born—indeed it was almost choked by it: five minutes afterwards it made about an ounce and a half of urine.

Dr. Blundell has not been able to detect any liquor amnii in the stomach of the child, probably because it never got there. I am not prepared to say that some liquor amnii might not find its way into a child's mouth, and from thence down its throat; but I can imagine no such occurrence as common, and as a normal state of things. If any liquor amnii ever gets into a child's system through its mouth, it is just as probable also that it may do the same *per anum;* but in neither case, certainly, for any nourishing property the fluid possesses. Nor can I concur in any opinion that HAIR, REAL HAIR, from the head of the child, can ever be present in the meconium.

I have seen children live for a few hours after birth which were perfectly dropsical, and in a state of decortication, on the slightest touch, on any part of the skin and scalp; but NO HAIR, even then, came away separately: portions of the scalp, *with the hair*, came off together; and no single hairs could be plucked without portions of scalp coming away as well.

Waste cannot take place in the healthy vegetative fœtal life: such a circumstance seems opposed to this state of

* Note to Dr. Blundell's passage above quoted, from Majendie's Summary of Physiology, p. 177.

existence: therefore HAIR could not be found in the meconium of any child. The cases of dropsical and decorticating children occurred with the same woman, and I was fortunate in having the same nurse with me. Before the birth of the second child, she observed that "she hoped we should not have such another as the last;" but such another really made its appearance.

The first was Case No. 83, on 30th January, 1839; the second was Case No. 131, 9th November, 1839: the first child was a girl, the second a boy. Both children were born alive, but died very shortly after birth. The mother of these children was an honest and industrious woman—the father a very bad character; had had the venereal disorder several times; had lost the soft palate and septum nasi; and had once inoculated his wife with the same vile disease, though this occurred several years before the birth of either of the above children: he was also a very intemperate man in all other respects.

As we find meconium in the alimentary canal of the fœtus, we must consider that the intestines are therefore organisms in process of gradual formation, and are made use of by Nature as receptacles for effete matter from the embryo itself. Now what is the nature of this effete matter, and how is it deposited? It must differ materially from that which is afterwards the result of foreign substances taken and duly digested in the stomach. At present all is increase and appropriation, the fœtus not being able to take any foreign nourishment. In admitting the mere vegetative existence of the fœtus, we can scarcely deny to it powers bordering on those which ensue after birth. Its arteries carry blood to all parts of the body—its veins bring residual blood back: this united action keeps these sanguineous vessels open. By what means

are the absorbents, lacteals, and lymphatics kept open if, as is admitted without a doubt, they are tubes? Is the first moment of their birth the first moment of their action? Credulity might believe this, but there is no physiological argument which can substantiate the belief. They must therefore have actions to a certain extent, and it must be from these that effete matter is separated.

As fœtal fæces are deposits for a specific purpose, and differ so largely from the fæces of the child after birth, they must have an investing membrane, differing also in character from the true mucous membrane. The true mucous membrane, as it appears in adult life, cannot, in the first place, be a proper membrane for such fæcula in the fœtal life; and secondly, if the mucous membrane had no protection, how could it be suddenly called upon to perform such opposite duties as necessarily ensue in the change from fœtal to individual existence. The entire removal of effete matter of a meconic character from a large mucous membranous surface such as the alimentary canal, on which it has lodged for so many months, would leave this mucous membrane in a bare and very unprotected state, and render it incapable of retaining its integrity, especially as it is absolutely required that all the meconium should come away. It would be necessary, also, that the whole mass of mucous membrane should be renewed, and that, too, very quickly.

Would not the powers of infancy be overcome in this attempt? They could surely not withstand so rapid a change, and the renewal of a surface so great in extent as the mucous surface. Nor could any purely mucous membranous surface withstand the injurious effects of the presence of such large quantities of oxygen as the child begins consuming immediately after birth. As we are dependent

on the decomposition and appropriation of our own animal tissues to sustain our vital energies, which constant wear impairs, and but for these actions they would be always causing obstructions, we cannot get rid of them in any other way. That they are made to serve a second use, even when they have lost their first powers or duties, is an end only to be conceived and executed by Infinite Wisdom.

But, to return to the hairy particles noticed in the meconium: I believe them to be portions of blood-vessels,—remains of the first breaking up of certain internal structures of the fœtus, useful only to the fœtal state, and for a given time after birth.

"The most ordinary experience," says Liebig, "shows that at each moment of life, in the animal organism, a continued change of matter, more or less accelerated, is going on: that a part of the structure is transformed into unorganized matter, loses its condition of life, and must be again renewed."

We cannot imagine that Nature has left the young of man and animals wholly dependent on a precarious external or foreign supply of food, to carry on the vital principle in the earliest stage of their existence; especially when we consider that by far the greater portion of the human family are in such wretched circumstances, that even necessaries for the parent are wanting. Such a thought would violate the wisdom and justness of her laws. Nature's first law is creation: her second is to maintain what she has created. As long as the seed is kept in the condition of static rest, it contains unimpaired, even for years, those qualities which, when brought forward through the agency of other substances, and by new actions, germinate into a plant. The primary element of the vitality of the seed, the nitrogen, is contained within itself. Now, phenomena

nearly allied to this occur in the young of animals and in the infancy of man.

The child, and, in fact, the young of every animal, is born with the primary element of vitality, the nitrogen, in excess, or, more correctly speaking, with those elements which produce it. These, in the process of conversion into nitrogen, require an excess of alkaline nourishment to act properly upon them. At the maturity of utero-gestation the animal is born, and is born, too, with highly-organized and consequently nitrogenized powers, which are to be acted upon by the diet which custom has assigned to babes, and which reason sanctions even without the aid of philosophy; and this diet, in the state in which it is given, is, strictly speaking, of an alkaline character. But in what form do the nitrogenized elements exist in the child? In what shape are they to be found, to furnish for a certain length of time elements for respiration, for the repair of waste, which commences from the earliest period of existence, and for the reproduction or increase of organisms? The infant receives oxygen from the air even before any aliment is given to it, which must act on its own organisms to produce carbonic acid gas from its lungs in every expiration. Combustion must also begin early, in order to generate heat, and heat must have something to act upon. The time at which the mother's milk begins to be secreted varies from the birth to seventy-two hours, and even longer.

"Milk contains only one nitrogenized constituent, known under the name of *caseine*; besides this, its chief ingredients are butter (fat), and sugar of milk."*

Therefore only a small portion of new animalized matter

* Liebig.

is furnished to the child; the bulk is a natural supply for the powers of the stomach (increased by heat) to act upon.

"The blood of the young animal, its muscular fibre, cellular tissue, nervous matter, and bones, must have derived their oxygen from the nitrogenized constituents of milk, the *caseine*, for butter and sugar of milk contain no nitrogen."*

Now this is not strictly true, as the young animal is born with all these, *viz.*, muscular fibre, cellular tissue, &c., and consequently has them before it has taken any foreign substance, though there can be no doubt of Nature supplying the means of turning the caseine to the increase and support of the organisms mentioned. It must be known, and well known, to those who have had much practice in obstetrics, that it often happens that children take milk which has been eliminated from irregular or imperfect supplies of blood, as well as from impure blood, through illness or debility of their parents, and which has contained but a small portion by analysis of *caseine*, when compared with the absolute quantity required. Yet they still live on: the primary element of vitality is still in force. On what do they depend, supposing, as is sometimes true, that the nitrogenized elements of the milk are deficient, if they have not something within themselves to combine with the non-nitrogenized elements supplied? Nature is too wise to overlook a consequence so vital as the chance of her offspring not obtaining at such critical times the elements which they require to sustain life. Now, Nature has amply provided for this end certain structures which have their uses both in fœtal life and after birth; and these structures are—

* Liebig.

Section IV.—THE MEMBRANA MECONII AND RETE VASCULARE.

The first is a membranous sac, for the envelopment and security of the meconium; the second, a network of the most delicate blood-vessels, held together by a parenchymatous structure even more delicate: this is situated between the meconic membrane and the true mucous membrane. To these structures I now direct the attention of the physiologist, and will endeavour to illustrate by these, that none of Nature's gifts are ever single in their uses or application, but have always a second, a third, and even more uses than are at first apparent. As they exist in animals, as well as in the infant, at the time of birth, their discovery may lead to the solution of many points for which we have no means at present of accounting.

A learned professor has said that science owes nothing to accident;—but the discovery of both these structures was purely accidental. The first time I noticed the meconic membrane, or sac containing the meconium, was on the 5th of June, 1842, whilst attending a healthy young unmarried woman with her first child.

The head was large, and had a temporary difficulty in forcing its way out of the external passage: but the parent and child being both healthy and vigorous, and both apparently in the same mind, their united efforts were synchronous; and the uterine contraction of the one and the plunging of the other effected the object desired: so that the shoulders of the infant were received in the right hand

almost at the same time that the breech came into the left. Rejoiced at the event, the younker squalled, and by its efforts deposited in my hand its first gift. I laid him down to disengage this deposit; but judge of my astonishment when I passed it from hand to hand without its staining either. Of course, I immediately concluded that it must be enclosed in a membranous sac; and so it turned out to be. The surface presented a shiny bluish appearance, and had, external to it, an oblong orange-coloured piece of fæcula, about the size of the kernel of a cherry-stone. I placed both in half a teacupful of water and brought them away with me. Being perhaps too anxious to ascertain the true nature of the membranous sac, I washed it with repeated quantities of water, pouring off the discoloured liquor as often as was required until I obtained a clear transparent fluid containing small fragments of membrane, small and numerous *hair-like vessels* of different sizes and lengths, and the piece of orange coloured fæcula. These I placed in spirit and water, and they now form my first preparation of the meconic membrane. Since that time I have obtained several meconic sacs, and two are in spirits and water in a perfect state: one, dated 21st June of the same month, sixteen days after the first, and the other 12th December of the same year, 1842. Both these remain as I put them up, unbroken, though they are distended to three or four times the size they were when first voided. The spirit in each, though still transparent, is discoloured: one being a dark nut-brown and the other a bluish-grey colour: the sacs are, however, entire.

On the 2nd of December, 1843, I attended a lady in her confinement, and saw her again in a few hours after: both mother and child were doing well. In the evening, however, I was summoned hastily to the house on account of

the thread becoming loosened from the umbilical cord, which was bleeding copiously. I re-tied it, and waited to see the child's belly-band adjusted. When it was turned on its stomach, I noticed the meconium passing out of the rectum. I caught it in a small liqueur-glass three parts filled with water, and took it home. This I placed on glass, and incised it longitudinally upwards, extracted the meconium, and laid the membrane straight on the glass; and in this state it forms a very pretty dry preparation.

It frequently happens that the first fæcal motion of the child occurs at the time of delivery; and, knowing this, I have obtained some, and many broken ones, in the following manner. As the practice, however, is rather original, I take the opportunity of mentioning it here, since it is conducive to the comfort of the patient, by preventing large discharges, &c. from soaking through the clothes and round the person. As the patient lies on the left side, with the thigh at right angles with the body, and the calf of the leg at right angles with the thigh, a complete dam is formed. Having always at hand a teacup for the purpose, I use it for baling out the fluids, and emptying them into a receiving vessel. I have not unfrequently taken three, four, and even six teacupfuls of fluid which has come away with the secundines. I have received the most grateful thanks of mothers for this comfort; and of nurses, to whom it saves trouble when their patients are changed, and are being put to bed. I am also enabled to place a clean dry napkin under the leg, and leave them comfortable for an extra half hour, or hour if necessary, previous to their being moved, which is often of great consequence. This system of baling out the fluids I have adopted for the last six years, to my entire satisfaction in the plan; and by its

means I can obtain a meconium and sac, which otherwise would be lost.

Having made many dissections of the intestines of fœtuses of various ages, I have found both the Membrana Meconii and Rete Vasculare more particularly developed in the rectum and throughout the colon, and certainly present along the whole alimentary track, though less distinct from the colon to the œsophagus than in the colon and rectum. The drawings accompanying this Treatise show the various parts in detail.

Fig. I.—The peritoneal membrane and muscular coat of a part of the rectum of a fœtus between four and five months old, laid open:

A A A A. The muscular coat.

B B B. The peritoneal membrane.

C C C. The arteries and veins.

D D. The remains of small ruptured vessels resembling hairs.

E E E E. Branches of the vessels which anastomosed with their fellows on the opposite sides when the tube was entire.

Fig. II.—A portion of the descending colon, sigmoid flexure, and rectum of the same subject:

A. The peritoneal membrane.

B. The muscular coat.

C. The mucous membrane.

This portion of gut has the meconium contained within it.

Fig. III.—The mucous and meconic membranes and rete vasculare of the rectum of a fœtus, being the portion removed from *Fig.* I:

A A A. The mucous membrane.

B B B. The MEMBRANA MECONII and RETE VASCULARE.

C C C. The remains of small ruptured vessels resembling hairs.

The naked spot in this drawing shows where part of the rete vasculare and membrana meconii has been put aside by the scalpel, to exhibit the mucous membrane beneath.

Fig. IV.—The RETE VASCULARE magnified, showing its reticulations to be composed of blood-vessels.

B B. The RETE VASCULARE.

C C. The remains of ruptured blood-vessels resembling hairs.

I have found these structures to exist in the kitten, the puppy, and the young pig, and this in scores of subjects: I therefore reasonably conclude that it is natural to all young animals.

As some care must be used in obtaining a good specimen of the meconic membrane and rete vasculare, it may not be improper here to mention how this can best be accomplished. If it is desired to be obtained from a young puppy or kitten, in the absence of a human fœtus or still-born child, the best method of destroying the animal, as well as the most humane, is to strangle it. This soon rids the animal of life in a painless manner; and another advantage is, that the blood-vessels become highly injected—a great desideratum, and show the beautiful rete vasculare to perfection. Take a portion of the large intestine of the animal, and carefully dissect away the peritoneal membrane with a pair of fine-pointed scissors. Insert one point carefully under the muscular coat of the intestine all round, when it will easily separate from the mucous

membrane beneath. This muscular coat can be sheathed upwards, precisely in the same way as is done by butchers to get the mucous membranes of animals for sausage-coverings. The mucous membrane will not be easily wounded, except by a rough hand, as it is very firm. When a portion is denuded in this way, cut it off short, and lay it on a piece of glass: then cut the other end off square, leaving on the glass a piece the size required, say an inch or more. Insert the point of the scissors straight up the mucous membrane, and lay each flap carefully down, straightening it on the glass from its extreme edges. Remove the meconium very carefully with the edge of the scalpel, so as not to wound the rete vasculare, which is soon injured. Hold this up to the light, place a magnifier against the back, and the rete vasculare will be distinctly seen as in *Fig.* IV. in the drawing To be convinced that it is a distinct membrane, let it remain till nearly dry, then scrape a portion of the rete vasculare away as far as the mucous membrane, which will be found firmly adherent to the glass, as in *Fig.* III., A A. If the meconic membrane is required distinct from the rete vasculare, take a puppy soon after birth, and keep gently pressing the abdomen, and watch for its first fæcal motion, and as it comes away place it on a piece of glass; insert the fine point of a pair of scissors just beneath the surface, and cut longitudinally upward: a membrane will then be seen dipping occasionally through the meconium itself, where it will be found enfolding different portions. Lay this membrane down on each side, and remove the meconium. The membrana meconii will be found distinct from the rete vasculare, and this again from the mucous membrane.

With respect to the muscular coat, bring the stripped portion down carefully, and cut it off square as far as you

have removed the mucous portion: having cut this up longitudinally, lay it also on glass, and stretch it out from the edges, when, on holding it up to the light, and applying a magnifier at the back, the muscular coat and vessels will be seen as in *Fig.* I, A C. By these means, also, the meconium can at any time be obtained pure for chemical analysis, throughout any part of the alimentary canal.

The nearest approach to the discovery of the meconic membrane I find recorded in the 'Lancet' of 23rd March, 1844, in a paper read before the Royal Medical and Chirurgical Society by Dr. Davy, "On the Composition of the Meconium, and of the Vernix Caseosa, or lubricating Matter of the new-born Infant." Dr. Davy for the first time mentions "EPITHELIUM SCALES" as part of the composition of the meconium.

"Besides the ingredients to which the meconium owes its thick consistency and viscid nature, there is another portion from which the mass derives its colour and taste, and probably its power of resisting putrefaction, and which seems identified with the sapid and colouring matter of the bile. The specific gravity of meconium exceeds that of water: it sinks in a saturated solution of common salt of the specific gravity of 1148. The quantities of meconium which the author has obtained have been too small to admit of accurate analysis; but in a specimen obtained from a hearty child immediately after birth, the proportion of the ingredients were determined, and the results per cent. were about as follows—[these proportions he believes may be considered pretty correct]:

23·6	Mucous and EPITHELIUM SCALES.
7·	Cholesterine and margarine.
3·	Colouring and sapid matter of bile and oleine.
72·7	Water.
100·0.	

A portion of the same meconium was incinerated: it burnt with a bright flame, and left 69 per cent. of reddish ash, chiefly *peroxide of iron* and magnesia, with a trace of phospate of lime and common salt."

"The author remarks that, theoretically considered, as regards the origin of the two substances, the preceding results seem to point out distinctly that both are excretions, the meconium chiefly derived from the liver, and the lubricating matter from the skin."

"Mr. Lloyd found that the small intestines terminated in a *cul de sac*, and were perfectly distinct from the larger intestines, which terminated similarly, and were full of what appeared to be meconium.

"Mr. Stanley referred to a case, examined by Mr. Abernethy and himself, of an acephalous lamb, in which the *liver was totally wanting*, and yet the intestines were filled with a thick, yellow, semi-fluid substance, like meconium."

"Dr. Robert Lee said, that the facts communicated by Dr. Davy, in the interesting Paper which had just been read, proved that the meconium was an excrementitious fluid, composed of water, mucus, epithelium-plates, cholesterine, and the colouring and sapid matter of bile. About sixteen years ago he (Dr. Lee) was struck with the peculiar nature of the substances which were constantly found in the intestinal canal of the fœtus, the colon being alway distended with the dark green-coloured fluid usually called meconium, and the small intestines with a fluid resembling chyle. *He was led from these appearances to suspect that the processes of digestion and assimilation went on before birth.*"

After detailing the contents of the stomach and upper portion of the alimentary canal, he says,

"The great intestines were much more distended than the small intestines, and contained throughout a dark-green, homogeneous, generally neutral, or slightly *alkaline fluid*, in which no

albuminous matter could be detected, and which was, consequently, excrementitious, or fæcal. The absence of albuminous matter in the stomach of the fœtus, its invariable presence in the upper half of the small intestines, its gradual diminution as we proceed downwards, and its disappearance in the colon, were circumstances which proved that there was nutritious matter in the small intestines, *and that the absorption of this matter took place from the intestinal canal in the latter months of gestation, in like manner as these take place after birth.*"

The Doctor then adverts to the erroneous notion of the fœtus swallowing the liquor amnii for nourishment, and says:—

"From having observed in every instance the same yellowish-coloured fluid in the duodenum, collected in great abundance near the orifice of the ductus communis choledochus, and taking into consideration the size of the fœtal liver, and the large supply of blood which it received from the umbilical vein and vena portæ, it appeared reasonable *to infer, that the liver must be the source of the matter in question*..... Some physiologists had maintained that the fœtal blood was decarbonized by the liver, but this hypothesis could not be true, *because the placenta was the lung of the fœtus, and the blood of the umbilical vein was arterial blood.* The facts which he had now stated demonstrated that the fœtal liver secreted an albuminous fluid, which flowed into the duodenum, and which was gradually absorbed by the lacteals, and conveyed into the blood of the fœtus, in the same manner as the chyle was conveyed by the lacteals from the intestines into the blood of the adult. The nutritive materials of the fœtus were originally derived from the mother's blood in the placenta; but as no absorbents existed in the cord and placenta, it was obvious that these materials could only be conveyed to the fœtus through the umbilical vein, and that the blood of this vein might have mingled with it all that had been absorbed from the blood of the mother destined to nourish the fœtus. But these nutritious matters required further elaboration before they were fitted to compose

true fœtal blood, which was an essentially different fluid from maternal blood, and which was formed by the fœtus itself."

I am not prepared to deny that a passive digestive action takes place in the fœtus, or that a low state of chymification goes on. The liver evidently secretes bile; and in several beautiful preparations which I have on glass, the rete vasculare is tinged with bile, and separated from the meconic membrane. The first preparation which led to the discovery also bears out the fact of bile being secreted; but the orange-coloured piece of fæcula was EXTERNAL *to the meconic membrane*, consequently between it and the rete vasculare. It could have nothing to do with the meconium, being external to the sac; yet it was evidently the result of biliary chylification. Although a soft solid, it had all the appearance of the bright orange fæces of children after the meconium has been ejected; and it must have been the result of a process external to the meconic membrane, or it would have been IN the meconium. It must also have passed down externally to the meconic membrane, as it had sticking to it small hair-like fibrillæ which were, without doubt, remains of ruptured vessels of the rete vasculare; which hair-like vessels being found in the meconium have led physiologists to believe that the liquor amnii might have been swallowed, with portions of the hair of the head of the fœtus: a most unlikely event, as I have before noticed. The first preparation, showing the meconic membrane broken to pieces, will establish Dr. Davy's remark, of *epithelium scales* being part of the composition of the meconium, and by no means any portion of the epithelium of the true mucous membrane, which it is reasonable to suppose the Doctor would conjecture, in the want of knowledge of the meconic membrane. The large amount, in his analysis, of mucus and epithelium

scales can be sufficiently accounted for. For instance, the first meconium passed is that which is in the rectum, in a *cul de sac*, as observed by Mr. Lloyd, and about the third of an inch in diameter. If this is placed in water for a few hours, it swells to four or five times that size; but the meconium itself does not escape, as may be seen in the two preparations I have had by me for these two years past. The small quantity of cholesterine and margarine found by Dr. Davy may probably happen from the small quantity of bile on the external part of the meconic membrane present in his analysis: for I am inclined to think that chylification does not take place within the meconic sac, but external to it, as the meconic membranes in my possession are more tinged with bile on their external surfaces and along the surfaces of the rete vasculare than elsewhere, which leads me to believe that the meconium is an effete matter entirely *extra-biliary*.

Dr. Davy's analysis also produced, after incineration, "69 per cent. of reddish ash, chiefly *peroxide of iron* and magnesia, with a trace of phosphate of lime and common salt." The peroxide of iron clearly shows that a large number of blood-vessels, with their contents, must also have been present; and probably this portion of the meconium submitted to analysis contained a large amount of the rete vasculare.

The meconium, as found by Mr. Lloyd, *is* enclosed in the different portions of the gut in a *cul de sac*, which in animals are very distinct, dipping down like the arachnoid membrane of the brain, and often enclosing small pieces; yet the same portion of meconic membrane continues its enveloping character to other portions of meconium. My opinion respecting the meconium, differing as it does from Dr. Davy's and Dr. Robert Lee's observations of its being

chiefly derived from the liver, is supported by Mr. Stanley and Mr. Abernethy, who found meconium *in the total absence of any liver*.

The meconium, as Dr. Robert Lee observed, is greater and more solid in the large intestines, and gradually diminishes as you trace it up the alimentary canal; whilst this upper part has within it a more albuminous deposit. Two facts Dr. Robert Lee has clearly demonstrated, *viz.*, that the placenta is the lung of the child; and that the child does not swallow a filthy excrement, the liquor amnii, for nourishment: in both which observations I perfectly agree.

My great object in this discussion is to get fixed points for our philosophy, if we wish to clear away the mists which ancient doctrines have thrown over so interesting a subject. Sir Thomas Brown, in his Vulgar Errors, says, "Knowledge is made by *oblivion;* and to purchase a clear and warrantable body of truth, we must forget and part with much we know."

Assign, for instance, the duties of the uterus distinctly, and it will be found only to alter the arterial blood of the mother into catamenial blood, either in its unimpregnated or impregnated state; and that it increases in size by its muscular properties with increase of bulk of its contents, the latter being merely a mechanical action. Assign the duties of the placenta, and it will be found only to alter catamenial into placental blood, which is arterial blood of fit character for the formation, nourishment, and growth of the fœtus in all its organisms, and essentially different to maternal arterial blood; and as the fœtus increases, the fœtal arterial blood from the internal iliacs, passing through the umbilico-fœtal arteries to the placenta, there mixes with the catamenial blood under the process

of change to placental, precisely as the venous blood in the adult unites with new chyle conveyed by the thoracic duct to the heart, and is altered into arterial blood by the lungs. That the placenta also has a mechanical action, in receiving within its membranes the chorion and amnion, and one excrement from the fœtus, *viz.* the urine, which it has the power of retaining without injury to itself, and of preventing from being re-absorbed, to the injury of the organic actions of either the placenta or fœtus. Assign also the duties of the fœtus, whatever they may be, as a separate body; its organic functional actions of secretion and excretion; its powers of altering, in these actions, the placental arterial blood into fœtal arterial blood, the excess of which returns into the placenta through the umbilico-iliac arteries, whilst its venous blood, though scarcely differing from fœtal arterial blood, is retained within its own system, for its own special uses, together with all its glandular organic secretions, which are to be used again for natural purposes, in the same manner as they are in the separate individual existence after birth; its three excrementitious substances, the urine, the fæces, and the perspiration, being provided for by its mechanical powers:— the urine passing out of the bladder through the urachus, or via urinaria, in the early months more freely, and in the latter months by capillary attraction along the chord, into its proper position between the chorion and amnion:— the fæces, into the alimentary tract, where all hurtful consequences are prevented, such as absorption, from the fact of its being enclosed in its own investing membrane, the membrana meconii: the perspiration or exudation from the surface of the skin, either of the character of the liquor amnii or sebaceous matter, the former being received and retained within the amniotic membrane, which belongs to

the fœtus, and the latter aggregating and remaining on the surfaces of the child. These duties being once distinctly assigned to their proper organs, something like a safe and sound system of doctrine would be laid down on the entangled subject of embryology.

I have often thought what a pretty state of confusion the parent's system would get into if it were to receive residua and excrement from its fœtus or placenta. I am open to this observation from the curious-minded physiologist:—"Do you think, then, that impressions of the mother are not communicated to the fœtus; or that a fœtus cannot get a disease *in utero* from the mother?" My answer is, I believe both in combination with my own views, which are certainly not opposed to such circumstances. Being a fluid pathologist, how can I deny such truths? Does not the small quantity of semen carry with it *the idea of every thing* to form a being after its parent's kind: for, do we not see a boy the counterself of his father—a girl, the image of her mother? And am I to throw overboard the simple belief of fright or disease altering the atomic constitution of the blood from which another fluid has to be made; and that this second fluid will not be also altered in some inscrutable manner from its normal standard by such a principle, and which, in the process of contributing life to another being, will also alter or disarrange its system? No one entertains a doubt, I should imagine, on this head: for, if he believes so small a portion of an admitted fluid introduced as a foreign body into the system produces such important results, he surely cannot deny or even question the other proposition: both are as certain as they are mysterious and inexplicable by human knowledge. They are facts beyond philosophy to doubt, reason on them as much as it may. All human means should be used for

the explanation of vital laws, as they tend to the amelioration of the human family when these laws swerve from their integrity, and human means only are left to us to restore them. I am greedy to learn, and ready to believe good doctrines, even when Nature does not lift the veil to let us into her secrets of why and wherefore; but I am very ill prepared at present to believe, or even entertain for a moment many physiological doctrines which now pass current on embryology and the connexion with the parent and the contents of the impregnated uterus.

Philosophers have explained certain laws of Nature on a partial knowledge only of those organs which carry on these functions. We must still, however, regard all doctrines as ingenious or admissible, even after our own information has been perfected by new discoveries, or we should at once sink into a state of metaphysics, and be satisfied with nothing. The mind must have its satisfactory resting-places, though ever ready to progress when new prospects are unfolded to its vision by any maturer traveller in philosophy who offers to be its guide. We have taken the place of the last generation, and evidently to the advancement of science; but can we say that our theories will not be overturned by the philosophy of the new age which succeeds us? We cannot, without presumption; nor can we, without presumption, condemn new theories upon the basis of our past principles: I say past, because the moment that a new philosophy is started it becomes a present doctrine opposed to its predecessor: the war is between the two opinions, the old and the new. The old may have all the benefits of authority, or even prejudice; but the new has the advantage of still newer discoveries to support it. It happens, however, that the fortunate discoverer of new organisms in the animal economy

has an unfortunate duty to perform, as he will find it, in suggesting uses, or a new philosophy for them.

With regard to the philosophy of the use or uses of these new structures, I should perhaps be blamed if I did not throw out some speculations respecting them, as they first became apparent to me; nor can I be charged with presumption when I set out by confessing that I know no more about them and their uses than do those who are utterly ignorant of their existence. But, having taken precedence of others in my investigations into these subjects, I may be pardoned for anything I may say on the steps of this inquiry, when, at the same time, I open the door for those who are wiser and better able to enter into it, and give a philosophical reason for their existence.

Section V.—PROBABLE USES OF THE MEMBRANA MECONII AND RETE VASCULARE.

When Nature provides organisms, she also provides uses for them. It seems apparent that the meconic membrane is an organ of nature, made to detain effete matters within the alimentary canal, instead of their lying lodged in the mucous membrane; and that its integrity is kept up by the rete vasculare supplying it with blood. It seems meant, too, to prevent the bile from flowing into the alimentary tube, where it could have no legitimate duty to perform, as chylification is not necessary to fœtal life: for if chylification were performed, the bile must have something to act upon, and the product of this operation should be, or ought to be, used again. Now, there is no necessity for such an action, or such a product; as, in the first place, where this action exists there must be waste, and where there is waste there must be repair. How can there be waste in a purely vegetative existence, such as is the fœtal? What could be given to the fœtus to support waste if chylification were performed? No product or matter can make its way into the alimentary tube, save in the shape of effete excretions, and that must be considered as the ultimate end of all such matters. And if bile did get into the fœtal alimentary canal, it could only mix with the meconium or effete matter already there; but this I believe to be of rare occurrence. In the absence of the meconic membrane and rete vasculare, the meconium would rest directly upon the true mucous membrane covering the

muscular coat of the bowels. In that case there would be nothing to prevent chylification and absorption of the contents of the small intestine, as the mouths of the absorbents, lacteals, &c. terminate in the mucous membrane: therefore the meconic membrane and rete vasculare are barriers to the action of these vessels, whose actions, through these phenomena, must of necessity be extremely limited. Were it not for the intervention of these new structures, there would be no hindrance to the absorbents acting on the contents of the bowels, and taking up and carrying into the system — what? — an excrementitious deposit! The meconic membrane is plainly a false mucous membrane, which is present for a certain purpose in the economy of fœtal life, and lasts for a certain time only, and for a specific purpose in the child or animal after birth, as we find that that portion of it which is situated in the rectum comes away, in some instances, entire, with its contents, as a *cul de sac;* though probably, in the more numerous cases, it breaks and comes away piecemeal with portions of the meconium. It is by no means a smooth membrane, but appears laminated externally, and to have portions of its internal surface dipping into the meconium, in like manner as the arachnoid membrane dips into the brain.

The rete vasculare appears to be provided by Nature for the nourishment of the meconic membrane, as well as the mucous membrane on which it lodges, and to sustain the functional integrity of both during fœtal life. As far as I have been able to observe, it is the most beautifully-organized piece of network of blood-vessels the eye ever saw; and, when first taken out of the gut of a strangled puppy or kitten, most brilliant in colour. It may probably assist in keeping up a highly-organized state of the ali-

mentary canal during fœtal life, which, with the lungs, appear to be the only organs not performing functions precisely similar to those which they are afterwards called upon to do. I may also add another reason for supposing the meconium to be an independent deposit of any secretion of the liver, though this opinion differs entirely from received authority,—which is, that as the rete vasculare and meconic membrane are structures peculiar only to fœtal life, they must disappear altogether some time after birth, and Nature must provide for this first step. My impression is, that the bile traverses the whole length of the alimentary canal from the duodenum to the anus, and is, in fœtal life, the proper menstruum to lubricate the rete vasculare and the meconic membrane; whilst the meconium itself, by the aid of its antiseptic properties, prevents the chylification of these structures. There can be no doubt, however, that an attempt at digestion and chylification does occur in fœtal life, as the piece of orange-coloured fecula on the external meconic sac and membrane of my first preparation fully demonstrates; and also that this little piece of fecula passed down the alimentary canal between the mucous and the meconic membranes. This very act must have ruptured the union of the two membranes, in the track down which it passed, as it is carried on by the minutest network of blood-vessels: for, previous to washing it, as before described, I noticed the unattached surface thickly strewed with hair-like vessels.

As soon, no doubt, as the meconium has passed out of the system, the bile gets access to the centre of the meconic sac, so that chylification is pretty certain to ensue, as both the rete vasculare and meconic membrane are enclosed and surrounded by bile, which serves to digest them; and hence I have been led to the conviction that

this action gives the orange colour to the first infant stool. The great amount of organic matter in a state of decomposition acted on by a large supply of bile, already prepared throughout its whole extent to chylify it, would produce this result. If the orange-coloured stools of children are examined, they will be found to contain a very large amount of coloured mucous matter, in which is embedded the curdy portions of the milk.

And if these new structures perform highly-important duties during fœtal life, they appear to have equally-important uses after the birth. From this period all animals are as dependant on what they make within themselves by the decomposition and appropriation of their own tissues, as on what they take of foreign substances to support life. The action of the oxygen imbibed on the animal tissues constantly consumes them; and these being in an hourly stage of decomposition produce carbon, which they breathe, and ammonia, which generates nitrogen, the active and primary agent of their whole vital systems. What is there to interpose between the metamorphosis of existing tissues in the new-born child, supposing, as we have hitherto done, that there are no such structures as the meconic membrane and rete vasculare? Liebig has founded a beautiful theory on this inquiry, which seems to carry conviction with it, and would live and last undisputed, if the meconic membrane and rete vasculare were undiscovered things. He says,

"Now the circulation in the young animal is not weaker, but, on the contrary, more rapid; the respirations are more frequent; and, for equal bulks, the consumption of oxygen must be greater rather than smaller in the young than in the adult animal. But, since the metamorphosis of organized parts goes on more slowly, there would ensue a deficiency of those substances, the carbon

and hydrogen of which are adapted for combination with oxygen, because in the carnivora it is the new compounds, produced by the metamorphosis of organized parts, which nature has destined to furnish the necessary resistance to the action of the oxygen, and to produce animal heat. *What is wanting for these purposes an infinite Wisdom has supplied to the young animal in its natural food.*"

"The carbon and hydrogen of butter, and the carbon of the sugar of milk, no part of either of which can yield blood, fibrine, or albumen, are destined for the support of the respiratory process, at an age when a greater resistance is opposed to the metamorphosis of existing organisms, or, in other words, to the production of compounds, which in the adult state are produced in quantity amply sufficient for the purpose of respiration.

"The change and metamorphosis of organized tissues going on in the vital process in the young animal consequently yield, in a given time, much less carbon and hydrogen in the form adapted for the respiratory process, than corresponds to the oxygen taken up in the lungs. The substance of its organized parts would undergo a more rapid consumption, and would necessarily yield to the action of the oxygen, were not the deficiency of carbon and hydrogen supplied from another source."

Now this is exactly the light in which we are to consider these new structures. Does not waste begin with the first cry of the infant? The moment of birth is the moment for receiving oxygen into its system, and the moment for commencing the decarbonization of blood in the lungs. The carbon thus instantaneously generated there is expired in its first feeble cry. It has taken no milk, and consequently no caseine to add to its organisms, no butter (fat), nor sugar of milk, to make carbon or hydrogen; nor does it require these foreign assistances. The oxygen already begins acting on those extensive animal tissues no

longer required for their fœtal purposes, *viz.*, the meconic membrane and rete vasculare, which are supplied to it by Infinite Wisdom at its birth, *and in the entire absence of its natural food.* A child thrives better for the first few days *in the entire absence of its natural food.* I have had abundant proofs of this; and am strict in my injunction to nurses not to give a new-born child any nutriment, even if the parent's milk does not come for one, two, or three days. It is not only unnecessary, but hurtful. If they are not fed they sleep long and soundly, and tranquilly, and are quiet, good babes; but if fed, they are wakeful, cross, and fractious. I have had these truly practical observations borne out by several most experienced and observing nurses. "I found," said one most excellent creature, Mrs. Finch, "that my babies were always cross and troublesome at first; and I thought the food I gave them caused wind, until I discovered that it was best not to feed them at all, and ever since that I have always had good children." She, of course, could not account for this; but it shows she was alive to her calling, and, what is more, had sense enough to depart from old usages and prejudices—a sense which very few of her calling have, and which is therefore highly to be commended as an example. Children, however, cannot live without food, any more than adults: they may be put to the breast, after a time, when they are dressed, and the parent comfortable in bed, because the sucking of the nipple, even when no milk is present, causes them to draw in a greater portion of oxygen, and practises them in deglutition. It serves also to stimulate the lacteal glands of the mammæ, and to divert the current of blood from the uterus through the abdominal arteries to the mammæ, and thus relieve the uterus, which no longer requires so large a supply of the vital blood. I am

certainly always best pleased when the parent's milk does not come till the second or third day, for the reasons I have stated. The oxygen then has time to consume the superficial portions of the membrana meconii, whilst the first milk, (beautifully and wisely made aperient!) detaches the meconium from its membrane, and assists in its expulsion from the system. The meconic membrane afterwards becomes very pulpy and mucous, the rete vasculare loses its supply of blood, and the milk gradually taken by the child becomes, with the bile, its proper menstruum. The bile penetrates and mixes with both the membranes, and the mucus, now formed in abundance; and we see the bright orange and yellow fæces peculiar to infancy.

The decomposition of these new structures goes on very rapidly and regularly, and generates large supplies of carbon, ammonia, and nitrogen. These more acrid and acid constituents are, however, neutralized by the alkaline properties of the new milk, which is very quickly curdled by them, as well as by the alkaline properties of the bile, and a very brisk effervescence takes place. The activity of the bowels of the child is not brought about so much by their muscular action, as by the chemical action of their contents. See a child nursed in the arms with a tight napkin on, and its nates resting on the hand or arm of the nurse, impediments sufficient, one would suppose, to stop the action of the sphincter ani: yet with what power a motion is ejected even in opposition to this force. During the washing of a child the nurse will have indications of the bowels acting, and will catch the motion in a receiving vessel: there it is pure and free for examination. Its smell indicates the large amount of decomposed animal matter of which it is composed: the curdy state of the milk in it, and the innumerable globules of air, show the acid stage and the

highly-fermenting process going on. Here, then, the similarity to the first process of vegetation is shown. Diet of a purely alkaline character is required, let whatever changes there may take place in it in the child's system. Here the humoral pathology continues to bear down all opposition to it. The young animal is, after birth, as well as during fœtal life, supported on humoral principles alone. How can its stomach act on solids? and when it can, what are Nature's indications of the change but the coming and presence of teeth? Early teething shows early strength of the digestive powers; late teething, a late power of bearing solids in its system. The early months of infancy require the simplest, yet most judicious management. How long the meconic membrane and rete vasculare take to be entirely decomposed and carried off I am not in a position to determine: the time, no doubt, varies according to the constitution of the child, but this is guided by certain laws. The repair of waste is probably made up by the nitrogenous constituents of the caseine of its parent's milk, on the one hand, and the greater amount of nitrogenized constituents of its own organisms by the decomposition and appropriation of the meconic membranes and rete vasculare, on the other. The non-nitrogenized constituents of the milk act as a foreign menstruum on the nitrogenized portion of these animal tissues, the product of which is carried out of the system in the form of effete matter. The difference, therefore, in a thriving child, and a poor, thin, atrophous one, appears to me to consist in the power within it, on the one hand, to dissolve its new structures, and free the absorbents, as well as on the power of the absorbents themselves to take up nourishment; and, on the other hand, the retention and undecomposed state

of the rete vasculare prevents the absorbents from acting, by closing their mouths: for we find some children, in a state of atrophy threatening life, suddenly gaining lost ground, and becoming fat and thriving. As these phenomena seem inseparably connected with the treatment of infancy, I will conclude this treatise with a few observations which the discovery of these new structures has led me to make.

Section VI.—TREATMENT OF INFANCY.

Whatever value is attached to the present philosophy of the treatment of diseases of infancy, the views of the writers must be limited, though many important truths may be found in them. Their doctrines, based on experience and deduced from a number of cases bearing out certain theories of practice, are yet fallible, from the very lack of information on many important points. When the best theories err, we look, of course, for reasons for their erring. The ambiguous manner in which many men express their opinions is one source of error, and sometimes gives rise to a suspicion that they are merely keeping a hole to creep out at if wrong; or, if a favorable light be thrown upon their doctrines, and what was all involved in darkness becomes day, they may say, yes, that was the view intended, and take the benefit of the very ingenious interpretation of their meaning, which brings something out of nothing by most laborious deductions. The want of clear powers of deduction is eagerly seized on by our opponent, and is rebutted, on the other hand, by such vague terms as the "Vis vitæ" or "Vitality," which admit of no explanation, but are bandied about as words from which there is no escape, which mean much and explain little, because they are not understood. In all arguments, the suspicion seems never to occur, that something is still undiscovered which would solve the question at once.

In the treatment of infancy, the long practice and obser-

vations of centuries may lay a good foundation, as they do in the practice of medicine generally. Still, without those principles, which should be as true and as firmly established centuries ago as at the present day, or as they may be centuries hence, changes must and will ensue. But we moderns, heaven help us, say, medical science is improved since the last century, and is daily improving, and we must not compare past with present knowledge: indeed, it would be beneath our dignity to do so. Still we quote the ancients; still we prescribe the curriculum of study, particularly as to the languages in which the ancients wrapped up their ambiguous meanings; and we form societies of men to bring the study of medicine into a wholesome state; and republish old yet sound doctrines of effects for their day, in their original Latin,—a step, I trust, in advance towards the republication of the able and glorious works of Hippocrates in their original Greek. Now, these contending views of one subject puzzle a plain matter-of-fact being like myself, and lead him to cry out with the poet, in the agony of indecision, "Which way shall I turn?" I hear that the former practice of medicine is not to be compared with its present state, and yet I see the republication in Latin of the labours of old observers, which, though good, add nothing to the *facts* and *effects* which they have left so uncertain and so bare as to *causes*. Of a truth, this is a droll world, and the wisest amongst us has not much to boast of.

Considerable modifications of the treatment of infancy, from the principles at present laid down, must, I think, ensue, if the presence of the meconic membrane and rete vasculare is proved to exist. My own views may be far from right, and I do not set up my horn and condemn others: far from it, my only aim is to attack unexplained

doctrines; and if I call in question any old, or suggest any new views, I give such reasons for doing so as, I trust, will prove their apology.

In the first place, I must condemn the usage of giving castor oil, or other aperients, to infants as soon as they are born; and of giving them calomel or opium, either in its crude state, or in the form of tincture or syrup; and I will proceed to give my reasons. It is injurious to give castor oil, as it tends to bring away part of the meconic membrane before it is in a fit state to be detached from the rete vasculare, or from the system itself, and thus causes pain and uneasiness in the child. An oleaginous purge is beneficial when the meconium itself does not come away; but even in that case castor oil should not be given in a crude state, but mixed either with milk in a table-spoon, held over the flame of a candle or spirit-lamp, which produces complete union of the two substances; or, a teaspoonful may be well beat up with syrup, or moist sugar and water, and the child fed with it, the mass consisting of four or five teaspoonsful. This mixture disseminates over the stomach; is digested with other matters; is carried with the chyme into the alimentary track; and will serve to bring away any flatulence or meconium without injury to its membrane. Calomel should not be used, because it acts too powerfully on the liver, and causes an excess of bile to flow into the alimentary track. Besides, this organ is anormally large at birth, and can scarcely be said to recover for some months its proportionate size, or from the office with which it was endowed during fœtal life,—that of being the great highway for the blood from the placenta to the fœtus itself: therefore this organ should of all others be kept as quiet and as unexcited as possible. Excess of bile has an injurious effect on the new structures, which

are not in a fit state to be acted on by considerable quantities of it, as they are not sufficiently dissolved, and as solid pieces or lumps of mucus may be brought away which have not had their animal properties separated. By this course of treatment the infant is deprived of its natural nitrogenized nourishment: independently of this, the liver, once over-stimulated, soon becomes torpid, and more calomel is required. It is, therefore, a bad plan to begin with it; and why it is given at all to infants is a question perhaps easily, but not satisfactorily answered. It acts too powerfully on an infant's absorbents, which are thereby compelled to take up crudities that overload its circulating system, and have an injurious effect on the capillaries, producing great congestion. It is a very stimulating drug in its first action, and afterwards becomes powerfully depressing. What agent, therefore, can be so hurtful as this for an infant's system? Such practices lead to cutaneous eruptions, bilious diarrhœas, marasmus, and other maladies. I have had many almost intractable disorders in infants to manage, from the imprudence, and almost wickedness, of giving sucking children calomel. In the natural state of an infant's system, it is impossible that either functional derangement or organic lesion can take place sufficient to warrant the administration of calomel; and notwithstanding that high authority in the profession applauds it as a useful and harmless drug, it is a doctrine with which I shall ever differ. When parents give their infants this drug, they baffle their own anxiety to see them healthy; and while they think they are benefiting them, they are really administering a baneful and slow-consuming poison.

I have found the Hydrargyrus cum cretâ, or grey oxide of mercury, a most useful preparation in cleansing the

alimentary canal of infants, followed by a small oleaginous purge. In examination of the stools after its use, the whole of the powder has appeared to come away; but, indeed, the small quantity given—about three grains—could not, if it lodged in the system, affect it injuriously. It is the only preparation of mercury I have ever deemed safe, either in childhood or in the adult state; and, if properly handled, I firmly think it can be made to answer all the purposes required of mercury.

Infants, too, should not have opiates given to them. All the objections made to castor oil and calomel may, in an opposite sense, be applied to opiates. If we examine the action of opiates, we find them anodynous, sedative, and narcotic. With regard to the first, their actions are divided into "paregoric, hypnotic, and narcotic."* Sedatives are medicines "which diminish the animal energy without destroying life."† Narcotics: "We are content to confess that we do not know how narcotics act."‡ Now here at once comes one of those unexplained facts in medicine which meet us at every turn; a *vox et præterea nihil*—a name given to something which everybody knows and which nobody understands. Such are names, and such is medicine in the nineteenth century! "Cullen believed that the stimulating effect (of narcotics) is owing to the resistance offered by the *Vis Medicatrix Naturæ* § to the sedative influence of the medicine; and hence that a large dose is immediately sedative, because the resistance of the system is overpowered. Brown, on the con-

* Hooper. † Ibid. ‡ Ibid.

§ This is another *vox et præterea nihil*, to which the term *vitality* has been also applied, and is none other than the "Nature" of Hippocrates; the "Archæus" of Van Helmont; the "Anima" of Stahl; and which no one can explain.

trary, maintained that narcotics are in reality highly-diffusible stimuli, which exhaust the system by the rapidity of their action." If, however, we indulge in wine, spirits, or beer, enough to render us inebriated, we very soon get into the narcotic stage. From this circumstance Brown probably took his notion of the opiates, *i. e.*, he did not like to give up the intermediate stage between the stimulating and narcotic effects, or that stage which, not being able to continue any longer, ended in a temporary collapse, a temporary apoplectic, a temporary paralytic, or what was supposed to be a narcotic state of part or of the whole of the system. With regard to the effects of stimuli, when taken, they induce the absorbing system to take up more than is necessary for the nervous system to bear; which system, though working with all its might, cannot get the circulating vessels to appropriate this extra quantity fast enough: the consequence is, that a temporary congestion ensues, and the nervous system loses its power from the greater action of the *vis à tergo*, which power, though still aided by a low action of the nervous system, must become exhausted before a correct state of affairs again takes place. Now, if we omit the stimulating stage, and admit that some portion of the opiate is first carried into the system by the absorbents, which lessens the arterial action because it lessens the nervous, and afterwards paralyses the action of the absorbents, by stopping the flow of chyle through them, thereby retaining it in the alimentary track, we have congestion, as a matter of course, to a greater or less extent in the nervous centre, the brain; which congestion continues until its effect is worn out or overcome by the system gradually getting into its former state, first slowly, and afterwards with its usual energy, if it be strong enough to do so. When the

pabulum vitæ, or the vital agents, are in full force in adult life, these collapsed, apoplectic, paralytic, and narcotic actions may be resisted; but not so with infants. I have shown that a large mass of animalized matter, of Nature's own providing, is in a constant state of decomposition, and in the first stage for appropriation by the assistance of the absorbents, &c. If we give an opiate, even of the mildest kind, in this state, when their blood is losing the fœtal character and assuming the pure arterial; when it is necessary that external heat should be constant, and the circulation exceedingly regular; when the decomposition of the vast quantity of animal matter covering the whole extent of the alimentary track should not for one instant be checked,—what must be the result when all these actions are stopped by an opiate, but a pressure on the sensorium—a collapse—an apoplexy—or a paralysis? Those parents who give syrup of poppies, Daffy's elixir, Godfrey's cordial, and a host of other remedies to their infants, for trifling complaints, will have their anxieties terribly increased by real diseases produced by their administration, and by detaining the proximate causes in the system, which being acted on by exciting agents produce them; and these diseases will be hydrocephalus, scarlet fever, measles, and skin eruptions: or, by the use of these drugs, they become afflicted witnesses in a coroner's court. The natural diseases of children are few, and are easily managed by the simplest remedies; but the artificial diseases of children, produced by bad treatment and false philosophy in medicine, are numerous and direful. As the diseases of children are few and simple, so are the remedies. Children, for the first few months, require gentle, not heroic treatment. If fractious, a few drops of ipecacuanha wine in water and a little

syrup will relieve them, which may be followed by three grains of the grey powder and a small dose of castor oil, as previously directed. Attention to warmth is a most important matter in their management: if children get cold feet or hands, they will continue unpacified for hours. There may be and are times when children require a sedative; and although I have condemned the use of opiates in a wholesale way, I do not deny their beneficial action. When I have occasion to administer them, it is with the greatest caution: a few drops of the syrup of poppies, combined with vinum ipecacuanha, and never without; and I am inclined to think that the effect of the sedative is quicker in its action, the purpose sooner answered, and the duration of its effect shorter and more efficient when so combined, and as a consequence less hurtful, than when given alone.

The progress of diseases in children can be more readily detected by Glossological means than any other: hence the value of this study. But, upon this subject, I beg to refer the reader to Plate VI. and page 74 of my Paper "On the ADDITIONAL Means of Diagnosis of Disease to be derived from Indications and Appearances of the Tongue." The drawing shows the gradual fouling and cleaning of the tongue in infancy.

One point, more particularly, in the management of children, I should hold out a caution against: namely, the treatment which some parents inconsiderately adopt, "to bring them up hardily," by the free use of cold applications and baths. When we know that the circulation of the child is carried on more superficially than in the adult, and that a greater degree of heat is generated on its surface than internally, care must be taken not to check it, even for a moment, by undressing it in a cold room, or

putting on cold clothes, or washing it in cold water. Such practices drive the heat from the surface to the centre too rapidly, and infants cannot recover the shock. Great internal heat is not required, either for themselves or for the digestion of their light diet, but when in excess is positively injurious, as it produces glandular congestions, mesenteric enlargements, strumous diatheses, and scrofula. Their diet is so simple, that the process of digestion causes but little heat; whilst the quick combustion or effervescence of the non-nitrogenized constituents of their food with the decomposing animal matters within their system, assisted by the large quantities of oxygen which they consume, causes not only ready, but forcible motions, which carry off the heat thus generated; and which combustion or effervescence, more than the muscular action of the alimentary tube, is the process which Nature uses to unload their bowels.

With the adult the reverse of this takes place, greater heat being required internally than externally for the digestion of the variety of food taken; and we all know how invigorating cold is when judiciously applied to the surface. Greater muscular power of the bowels is also necessary in the adult, to propel effete matter along and ultimately out of the alimentary track.

The assurance I have of the existence of the meconic membrane and rete vasculare, and of their probable uses both in fœtal life and after birth; the duration of time which these structures take in their development before they entirely leave the system, and their beneficial uses during the time in which they are slowly going through this process; the activity, too, of their conversion into vital agents, and the changes thereby finally effected in the whole system, in every way in which animalized matter

performs its part in the grand series of operations connected with our subject, lead me to consider them in connexion with what might seem, at the first glance, of very remote affinity to them, but is more closely related than may be supposed—I allude to vaccination.

Vaccination is now enjoined by Act of Parliament, and Ministers for the Home Department are bound to keep a watchful eye on the advent of smallpox. It may happen that some consideration will hereafter be paid to the most fitting time to vaccinate an infant; an unconsidered point at present, though not an unimportant one. Whether my views upon this subject are sound or not, I feel I should do wrong if I did not direct attention to it. Children, with the most common care, have much fewer and slighter maladies while under three months old, than they are liable to after that age. Of all the diseases which affect life in the first three months, I believe smallpox to be the most rare. From what I have said in connexion with the presence of the membrana meconii and rete vasculare, it will be seen that light diet, with free air and oxygen, so act upon these structures as to support life vigorously and healthfully; and in doing this infants are more able to throw off or avoid diseases of a character like the smallpox. If infants, therefore, have this innate power of counteracting natural diseases, they have equally the power of throwing off that which is thrust upon them, or whatever they are inoculated with. I do not think that there is as much dependence to be placed in the preventive action of vaccination, if performed within the first three months, as when it is done after that time; and though it has become the law to vaccinate all children, it is so far a human law, with its attendant imperfections, in opposition to the laws of Nature, which have not been first sufficiently considered. If it is

now a wonder that smallpox is taken after vaccination (when performed according to Jenner's rules), it may hereafter be shown to be no wonder at all. Experience has led me to think that vaccination should not be performed on an infant *under three months old;* or, if it must be done previous to this time for the parent's satisfaction, that it should be done again within the year *for the child's safety.*

Since I have discovered the presence of these new structures, and reflected on their probable uses, I have not vaccinated any child under three months old. No child that I have attended during the last two years has ever had smallpox in that time; and none that I have vaccinated after the age of three months have failed in taking the virus. Before that age, the proportion was large of those I had to re-vaccinate a second and even a third time, though the virus used in the first operation was taken from the same subject, and succeeded in others. What, then, was the cause why these threw off the vaccination, unless, indeed, it was the power of the healthy vital agents, in course of metamorphosis, resisting the disease? When parents were alarmed at their children not taking vaccination, the consolation I gave them was satisfactory enough: if they would not take what was positively inserted *in substance* into their systems, they would not take that which could only come insidiously and through impalpable agencies.

I may say that the beneficial results of vaccination are thwarted by its being performed too early, or previous to the age of three or four months. If performed after that time, there will be more security against smallpox, and more likelihood of ultimately exterminating it; though it is my firm belief that even vaccination will be hereafter

superseded by more philosophical prophylactic measures. This, however, is not a subject for theoretical speculation. The powers that be, and to whom are delegated the administration of laws for the benefit of the whole community, can put it to the test, by promoting enquiries and collecting statistical observations. A short time would test the truth or fallacy of the rule I have prescribed to myself, viz. never to vaccinate under three months; but where I did, I did so for the parents' satisfaction only, not considering any such vaccination sufficiently protective unless it was performed a second time, after the lapse of a few months.

I trust, in conclusion, that the discovery of the membrana meconii and rete vasculare may lead our eminent men to the study of embryology and the treatment of infancy in connexion with these new structures, and to their uses after birth: for I feel assured that no true doctrines can be founded on the physiology or pathology of the embryo and the infant without *their* demanding a large share of their consideration; and that no "Treatment of Infancy" can be adopted without reflection on these structures.

Much good or evil rests on this: for, as in the prince's, so in the peasant's child, this truth will hereafter be proved — that on early treatment depends the future vigour of the man: on the treatment of the infant Prince depends the future vigour of body and strength of mind of the King.

APPENDIX.

Note to Case No. 304, p. 9.

This person was confined by me on the 30th December, 1844. About three weeks before this event she was out in the evening, and was frightened by some rascal personating "spring-heeled Jack," and swooned in the street; she felt her child apparently turn, and was for some time confined to her bed and sofa, with pains in the groins, as though the child pressed low down in those regions. Her parturient pains were regular and strong; and at the end of twenty-four hours she became greatly exhausted. The amnion and bladder of water came down to the external passage, and I could not detect the presentation. When it burst, the liquor amnii was mixed with meconium, indicating a breech case, which was afterwards proved by the taxis. As the child still continued high up, I assisted the action of the uterus with the ergot, and brought down the legs: some difficulty occurred in bringing the arms through the pelvis, and one became impacted for some time between the head and pelvis: afterwards the head alone became impacted. The child was alive when the legs were presented, but when entirely born it was dead. Hot-water baths were resorted to, under my direction, by the nurse and friend, my attention being taken up with the mother, who became very much exhausted, though no

flooding took place. She is at all times a very nervous and very irritable woman, and the late fright had rendered her more so. We did not succeed in restoring the child, which I regretted, as I never saw a finer and more perfect male child, notwithstanding the severe floodings in the early months of pregnancy; which bore out the remark I had made in this case, that "the ovum and its contents remained uninfluenced by the eight weeks' flooding." There was a large quantity of liquor amnii, and the child was very clean. Previous to the rupture of the amnion, which was very tough, I could peel the chorion freely away; and during the time this stage of the labour lasted, there was considerable moisture and discharge.

Note to Cases Nos. 76, 69, and 287, p. 23.

On the 3rd December, 1844, E. H., the wife of a stonemason, was confined with her first child, a boy; and on the second day she passed a large mass of partly-organized matter, not of the firm consistence and cake-like appearance of a blighted ovum, though it might have been the rudiments of an ovum, or a partial deposit in the uterus, which Nature endeavoured to form into some shape or other with the elements she had to work with. This person was considered by her neighbours pregnant up to a certain period, about the fifth month, at which time she was considerably larger than at the hour of parturition. Being her first child, and from this falling off in her size, her neighbours were jocular, and suspected that she was not, after all, *enceinte*. The organism which passed away was no doubt the

cause of the enlarged appearance during the time of its growth; but when that growth was stopped, it, doubtless, dwindled in size: with its growth her size increased, and with its decrease so was hers.

About this time I was asked the following question by another patient:—"Can a female miscarry with one child and go on with the other, supposing it was a twin-conception?" That is, could a blighted ovum be safely ejected from the uterus, and another remain *in utero* and come to maturity? My answer was,—such a thing is probable, and probably not impossible! I cannot, on my own experience, answer the question satisfactorily. I may, perchance, have a reader who could answer it more fully: a reviewer, for instance,

"Some intellectual all-in-all,"

with vanity enough to think he knows everything!

THE END.

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GLOSSOLOGY;

OR THE

ADDITIONAL MEANS OF DIAGNOSIS OF DISEASE

TO BE

DERIVED FROM INDICATIONS AND APPEARANCES OF

THE TONGUE.

A PAPER read before the Senior Physical Society of Guy's Hospital, 4th Nov. 1843.

BY BENJAMIN RIDGE, M.D., M.R.C.S.E.

"There is much truth in the statements of the author in justifying his attempt to establish a new doctrine, viz. that unless it be based upon facts, it will share the fate of many of its predecessors, and be speedily forgotten. The importance of diagnosis must be too evident to require additional comment; and in as far as this desideratum can be accomplished by external signs, every attempt to facilitate it is praiseworthy. The Doctor takes a different view of the papillæ from that of most of his contemporaries. They are not, as generally supposed, the fine points of the gustatory nerves, devoted to the sense of taste, but they are follicles destined to the secretion of mucus. These are divided into different kinds. The advantages of the author's opinions upon the use of studying the appearances of the tongue, under certain guidance, are superior to any we hitherto enjoy, because they not only afford us a correct view of the system in general, but they put us '*above our patient*,' and enable us to detect any attempt at concealment or misrepresentation."—*The Lancet.*

"Dr. Benjamin Ridge's observations will, doubtless, prompt to a more attentive study of the diagnostic value of the tongue, (a study which cannot but prove of great service,) and are characterized by a disinterested earnestness of purpose, an ability and spirit of scientific research, which command the critic's respect, even when the author fails to win his assent."—*The Medical Times.*

"This treatise contains the substance of a Paper read by Dr. Benjamin Ridge before the Senior Physical Society of Guy's Hospital; and certainly, should the truth of the doctrines propounded in it be confirmed, Dr. Ridge has made one of the most vitally-important discoveries that has been made since the days of Hunter.....Should Dr. Ridge's views prove correct, it is impossible to exaggerate the importance of the science of Glossology, not only in the diagnosis of disease, but as a means of detecting deception.

"This book is well worthy the careful attention of the medical profession. Every practising member of that profession has the power of investigating the truth of these doctrines; and it is a duty he owes to himself, to his profession, and to his fellow-creatures to do so: for the nearer the approach to certainty in diagnosis, the nearer the approach to certainty in the application of remedial agents."—*The Sun.*

N.B. This PAPER was published by the author merely as an Introductory Address to the study of the appearances of the tongue in disease, under certain rules. It is, therefore, intended only as a grammar or elementary part of a system to be hereafter more fully described, when cases and pathological appearances will be brought forward to illustrate the truth of the indications of the tongue in disease. It is also intended to form an introduction to a NEW THEORY of the Practice of Medicine. By the tongue indicating the state of the system, a classification of disease, therapeutics, and diet will be made. These classes will be shown to correspond with each other, so as to insure the ready application of remedial agents to particular maladies.

PUTNEY, *January*, 1845.

JOHN CHURCHILL, PRINCES STREET, SOHO, LONDON.