

XVIII. *On the passage of the ovum from the ovarium to the uterus in women.* By Sir Everard Home, Bart. V. P. R. S.

Read May 1, 1817.

NO subject connected with physiology has more employed the attention of the anatomist and philosopher than the first formation of the embryo in the class mammalia, and yet even at this day, when the same subject has been completely investigated in oviparous animals, and it is known that an ovum is formed in the ovarium of the quadruped, the circumstances respecting its impregnation have not been ascertained.

The great HARVEY, although supplied by the munificence of his king with deer in all the different stages after being fit for the male, was unsuccessful. JOHN HUNTER, who prosecuted the same enquiry in the ewe, also failed. His brother, Dr. WILLIAM HUNTER, in his splendid work on the Gravid Uterus, has given the most correct representations of the human embryo from the end of the third week till the time of birth, but has not said any thing upon the subject of impregnation.

HAIGHTON and CRUIKSHANK, by experiments on rabbits, confirmed the opinion of DE GRAAF,* that an ovum is carried from the ovarium into the uterus, but by mistaking the corpus

* DE GRAAF's observations are mentioned in the 7th Volume of the Phil. Trans. p. 4052. In the same volume, p. 4018, Dr. KERKRINGIUS's observations concerning eggs to be found in all sorts of females are noticed.

luteum for the effect of impregnation, instead of the substance in which the ovum is formed, which at that time was the generally received opinion, got entangled in theoretical opinions, which misled them in their farther enquiries.

In this state of our knowledge upon this most interesting subject, accident has done what no predetermined experiments had accomplished, it has enabled me to detect the ovum in the human uterus. It is so small, that had not the uterus been previously hardened in spirit as well as the ovum itself, it probably would have escaped observation, and, after it was found, it could not have been identified to be the ovum from which a child was to be produced, had it not been brought under the eye of Mr. BAUER, the only person, I may say, in this or any other country, who could so correctly apply to it the powers of the microscope, as to determine its form; could so separate its parts on the field of the microscope, as to display its organization; and so delineate what he saw, as to convey distinct notions that it was the first rudiments of a child.

I shall first give the history of the woman's case from the time of her impregnation, and then detail the appearances that were met with in the uterus and ovaria, after death.

A servant maid, 21 years of age, had been missing from her master's house, on the 7th of January 1817, for several hours in the forenoon; she came home in high spirits, said she had bought a pair of corsets and some other parts of dress.

In the evening, she got her fellow servant to assist her in putting on the corsets, but on lacing them she complained of being sick, and all over unwell; on taking some brandy she

recovered a little, and went to bed. Next day she was much the same; the period of menstruation had arrived, but it did not come on, and from this time there was a wildness in her manner, and she appeared distressed in her mind. On the 13th she had an epileptic fit attended with delirium, and on the 15th, about ten o'clock in the forenoon, died.

After death, the uterus showed signs of pregnancy, and from the statement that has been given, she appears to have been impregnated on the 7th of January, eight days before her death; for, although she was known to have a lover, there are circumstances to prove, that she could not have seen him after that time, nor for many days before.

The uterus having been hardened in spirit, with the assistance of Mr. CLIFT, I examined the parts. The right ovarium had a small torn orifice upon the most prominent part of its external surface, we slit it open in a longitudinal direction, in a line close to the edge of this orifice; the orifice was found to lead to a cavity filled up with coagulated blood, and surrounded by a yellowish organized structure. Upon opening into the cavity of the uterus, its inner surface was covered with an exudation of coagulable lymph, beautifully represented in the drawing; (Pl. VIII.), the ovum lay concealed among the long fibres of coagulable lymph near the cervix, and was brought to view by separating them with the point of a needle which I employed in making the search. As soon as it was disentangled, it rose up, moving along with the loose ends of the fibres into the spirit, by which the parts were covered. It had an oval appearance, one portion of it was quite white, the other semi-transparent; but soon after, being exposed to the spirit, the whole

became opaque. The os tincae was entirely shut up with a strong solid jelly, the two orifices at the angles of the uterus, by which it communicates with the Fallopian tubes, were both pervious.

As the ovum was so extremely small as to admit of dispute, whether it was one or not, I carried it immediately to Kew to Mr. BAUER, who, after examining it, said that it looked like the egg of an insect. His drawings of the ovum and uterus, show to what an excellence microscopical observations can be carried, since in so small a particle of animal matter, he has pointed out the effects of impregnation even before any part of the vascular system had been formed, and where only the two projecting points within the ovum had been marked out as the future situations of the heart and brain. These two points are still to be distinguished in the ovum in a dried state, and that towards the broadest end is the largest.

Small as this ovum is, it bears a very fair proportion to that represented by Dr. HUNTER at the end of three weeks; and, had this woman lived twenty-four hours longer, the ovum would probably have in that time been united to the fibrous structure surrounding it, and appeared secluded from the cavity of the uterus in the same degree as Dr. HUNTER's is represented to be.

The corpus luteum has always been considered as the effect of impregnation, and a certain mark of conception having taking place, as I have already observed; but in this case there was not only the corpus luteum belonging to the present conception, but one still more distinct in the middle of the ovarium. This unexpected appearance of two corpora lutea, made me enquire farther into the subject, and led me to discover that the corpus luteum, in its origin, is a solid

compact glandular substance in which the ovum is formed, and, after the ovum is expelled, the blood which fills up the cavity is gradually absorbed, leaving a small cavity, which marks the place where the ovum had been.

Upon examining the ovaria of several women who had died virgins, and in whom the hymen was too perfect to admit of the possibility of impregnation, there were not only distinct corpora lutea, but also, as will be found in the present case, small cavities round the edge of the ovarium, evidently left by ova that had passed out at some former period, so that this happens during the state of virginity ; and, as in Mr. CRUIKSHANK's experiments, the fimbriæ of the Fallopian tube of the rabbit in heat, were found embracing the ovarium, although she had not received the male, we cannot doubt, that every time a female quadruped is in heat, one or more ova pass from the ovarium to the uterus, whether she receives the male or not.

These facts explain the error which physiologists have gone into, of mistaking the corpus luteum, in which another ovum is forming, for that which belonged to the ovum of the present conception, and which at the time of delivery has disappeared.

Mr. BAUER's drawings not only show the changes which take place in the ovarium, for the purpose of forming the ova, but also the internal surface of the Fallopian tube at the time the ovum passes along it in its course to the uterus, which I believe has never before been represented.

The appearances are so clearly shown in the drawings, that it is not necessary to describe them : I shall therefore confine myself to an explanation of their probable uses.

The dilatation of this tube, at a small distance from the

fimbriæ, appears to be fitted for the reception of the ovum as well as of the semen, and the ovum is probably retained in this situation for several days, to prolong the opportunity of its being impregnated.

It has been disputed, whether the semen ever comes in contact with the ovum, or even arrives at the uterus; but as Mr. HUNTER has proved by experiment that it reaches the uterus,* and as there is no impediment to its passage from that organ to the ovarium, it must be admitted that the semen reaches the ovum before impregnation can take place.

The formation of ova in the ovaria, and their appearing in that organ in succession, joined to the circumstance of animals during the warm season being ready to receive the male once a month, leads to an opinion very contrary to that which is commonly received respecting menstruation. This discharge has been supposed a previous step, preparing the uterus for uterogestation; and if a woman has not been impregnated soon after menstruation, it is presumed that she may be more fortunate after her next period.

It is clear from the case which has been stated, that such periods are totally unconnected with the formation of the ovum, the process of its leaving the ovarium, or its impregnation; but, if impregnation does not take place, such a discharge may be necessary for the relief of parts to which there had been so great a derivation of blood, as the only means of restoring them to their natural state. The uterus in women and in the monkey has a more compact form than in other animals, which may explain the circumstance of menstruation being confined to them.

* J. HUNTERUS canis fœminæ inter coeundum occisæ, uterum aperuit; quo facto maris semen in ipsum uterum, per saltus intromissum, clare vidit.

In proof of menstruation not being necessary for impregnation, I shall mention the following case. A young woman was married before she was seventeen, and, although she had never menstruated, became pregnant; four months after her delivery she became pregnant a second time, and four months after the second delivery she was a third time pregnant, but miscarried; after this she menstruated for the first time, and continued to do so for several periods, and again became pregnant.

I have given Mr. BAUER's account of the ovum, and the drawings he has made of it, in his own words, than which none can be more clear or satisfactory.

“ On closely examining the subject under the microscope, I found it consisted of membrane, which, considering the extreme minuteness of the subject, is of considerable thickness and consistence, very little transparent, quite smooth, and milk white, forming a kind of bag or pouch of an irregular oval shape, not quite $\frac{1.9}{200}$ parts of an inch in length, and in its middle about $\frac{2}{200}$ parts of an inch broad; on one side it has an elevated ridge or large fold along the whole length, and on the opposite side it is open nearly the whole length, but has no appearance of being torn, the edges of the membrane being smoothly rolled inwards, which gives it much the shape of a little shell of the genus *Voluta*.

“ When laid on glass, the membrane admitted easily to be laid open on both sides, with the point of a fine camel hair pencil. When thus opened, I found it contained another smaller bag somewhat less than $\frac{1.8}{200}$ parts of an inch long, and not quite $\frac{5}{200}$ parts of an inch broad, ending at the upper extremity nearly in a point, but the under extremity was very obtuse or truncate, and in the middle it was slightly

contracted, which gave it the appearance of a young seed capsule of some plants that contain only two seed kernels.

“ This inner bag consisted of a seemingly very thin, perfectly smooth, and glossy membrane, which seemed to have considerable strength, as it bore to be rubbed pretty strongly, not only with the camel hair pencil, but also with the point of the quill ; it seemed to be filled with some thick slimy substance, as an impression made on it with the point of the quill remained for a considerable time visible : it contained two round corpuscles, apparently more opaque, and of a yellowish tint ; they were not only visible through the transparent membrane, but they swelled the membrane over them, so that the light and shade made them to be distinctly seen ; and by slightly pressing the bag with the quill between the two corpuscles, they could be separated to a greater distance from each other, but on putting more moisture upon the subject, they returned quickly to their former position. This little bag was along its whole length, with its back part strongly fixed to the outer membrane, at least I could not remove it with the camel hair pencil, and more force I was afraid to employ.

“ I attempted to open the little bag, if possible, to extract the corpuscles, but on piercing, with the point of a very small needle, the upper extremity, a thick slimy matter, like honey, came out, and with the membrane adhered to the needle, so that I could no farther proceed ; and fearful of spoiling the whole, I gave up the attempt, and left the subject on the glass to dry ; but I observed, as the spirit and moisture gradually evaporated, so the little bag flattened, and, as if melting, shrunk into the outer membrane, and almost disap-

peared, but in a strong light was still visible in the microscope.

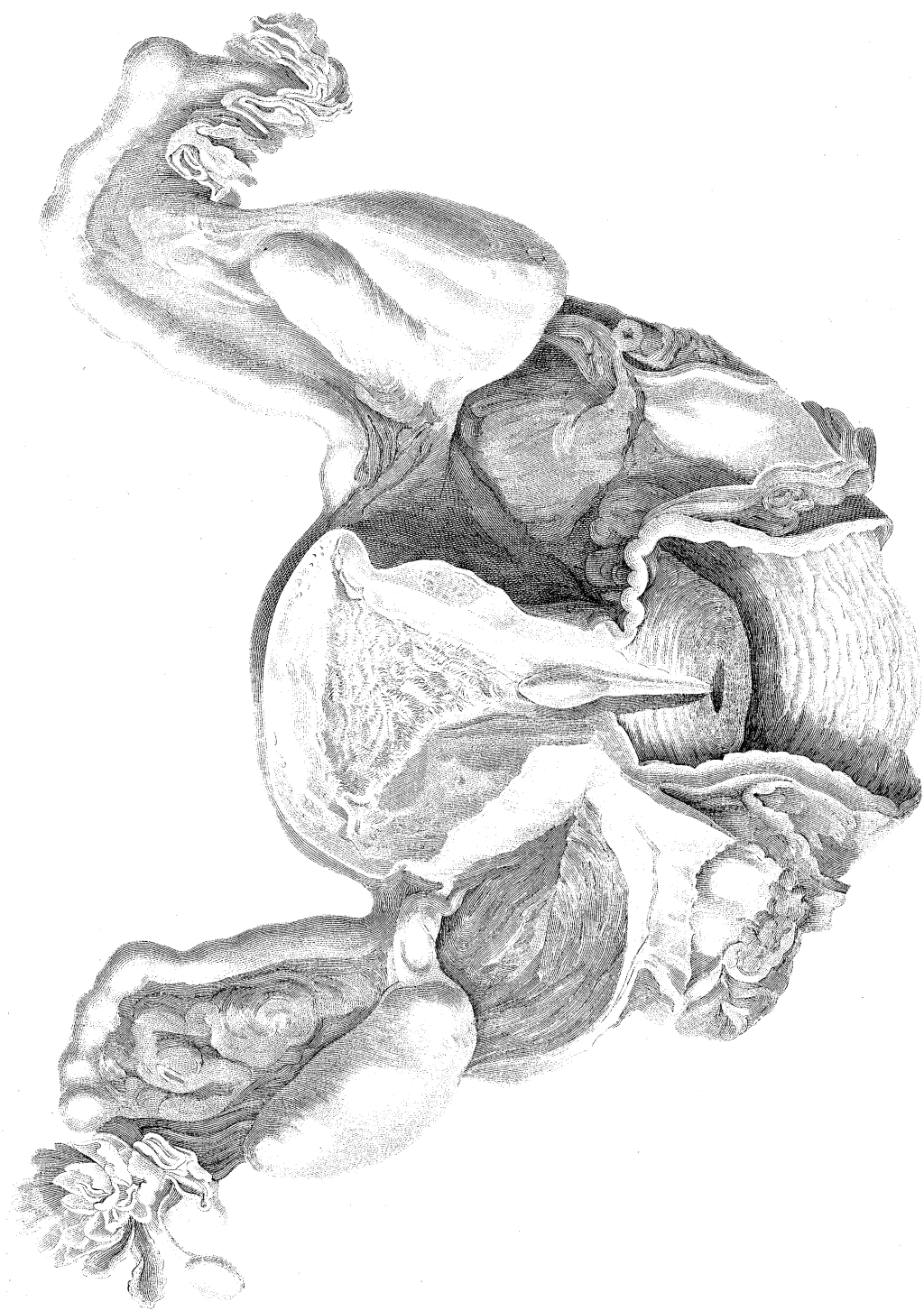
“ When quite dry, its colour changed to a light yellowish brown, and it lay quite loose on the glass, except at the upper extremity, where I attempted to open it; it was strongly glued to the glass, and it required several times to be moistened at that part with water, to remove it from the glass.

“ I have now placed it between two pieces of talc in an ivory slider; and in a strong light the two corpuscles may still be seen through a common magnifying glass.”

The drawing of the uterus (Pl. VIII.) is of the natural size: the parts are so distinct that no letters of reference appear to be necessary to point them out. The ovum is shown exactly in the spot in which it was discovered, with the appearance which it at that time put on.

The drawings of the ovaria and Fallopian tubes are magnified four times, to give a more exact notion, than could be otherwise done, of the canal through which the ovum passes, before it arrives at the cavity of the uterus. The appearance the corpora lutea put on, is the most exact representation from nature. In the right ovarium, cells remain where former ova had been formed, and one corpus luteum, which is cut through the middle, has made considerable advance in its formation, another appears to be in a much earlier stage, all the different orifices are the transverse and oblique sections of blood vessels.

In the left ovarium, the opening through which the ovum, the subject of the present Paper, passed out, is distinctly seen, and the cavity in which it was contained, is filled with coagulated blood in a laminated form; behind this, the glandular



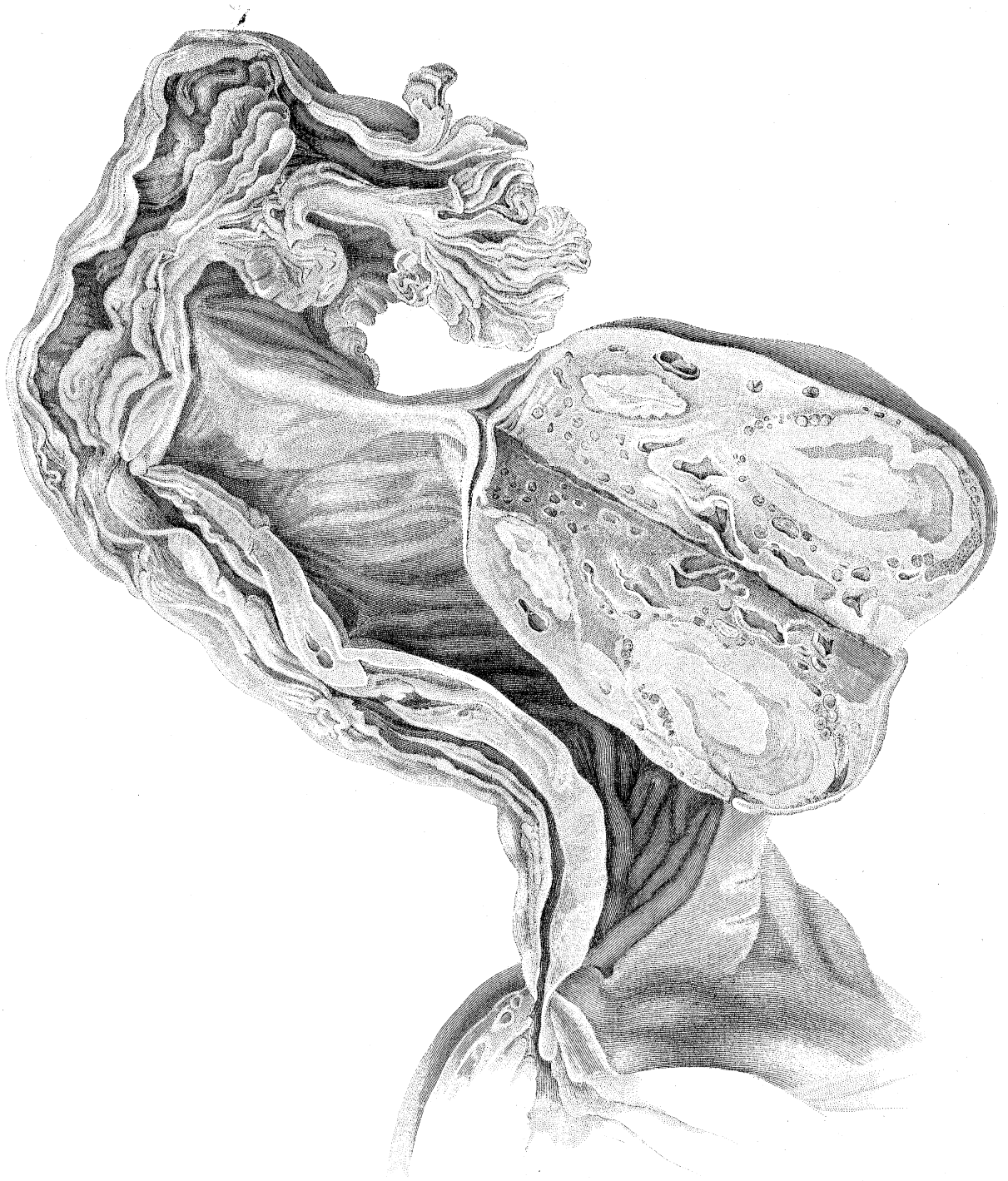




Fig. 1.

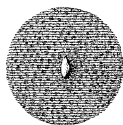


Fig. 2.

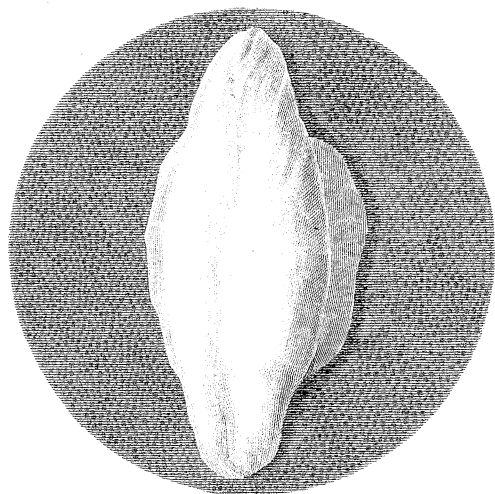


Fig. 3.

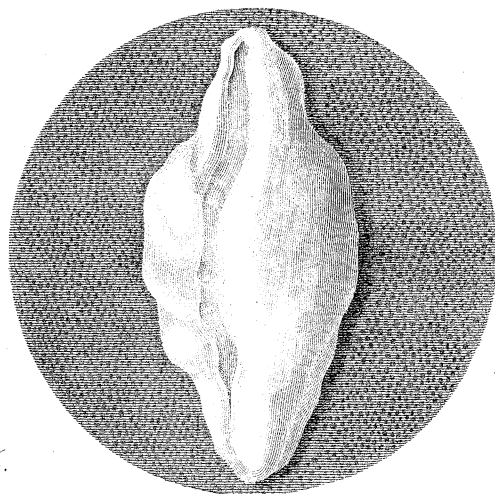
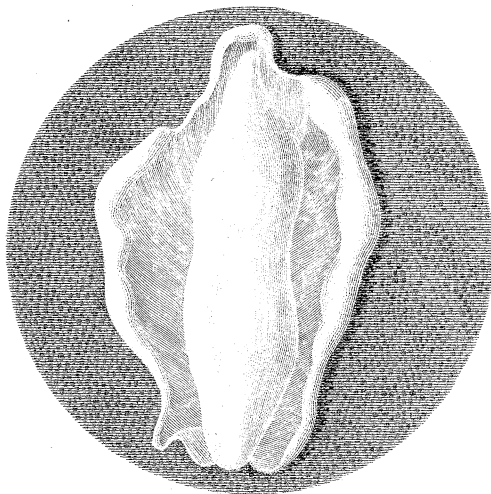


Fig. 4.



structure of the corpus luteum is readily distinguished, of the form of an irregular oval. Towards the other end of this ovarium is the transverse section of a corpus luteum, not far enough advanced in its growth to have a cavity in which the future ovum is to be generated, the whole having one uniform glandular structure, the general form, like that of the other, being irregularly oval. The orange colour, peculiar to the glandular structure of the corpora lutea, which is very bright, and forms their distinguishing character, is not given, as the drawing is intended to be engraved.

EXPLANATION OF PLATES VIII, IX, X, XI.

PLATE VIII.

The uterus laid open from behind, showing the ovum in the situation in which it was discovered. The other parts require no description.

PLATE IX.

The right ovarium laid open, showing the orifice at which the ovum escaped. The Fallopian tube laid open through its whole length. All these parts are minutely described in the Paper.

PLATE X.

The left ovarium and Fallopian tube laid open.

PLATE XI.

Different views of the ovum.

Fig. 1. The ovum represented of its natural size.

Fig. 2. The ovum magnified, exposing that side which is covered by one uniform membrane.

Fig. 3. The opposite side exposed, to show that the external membrane is disunited through its whole length, and unattached to the one under it.

Fig. 4. The two disunited edges of the outer membrane turned aside, exposing the inner membrane, through which are seen two very slight protuberances, the probable seat of the future heart and brain.