shall describe is No. XIII. It is a double vesicle, amnion, and umbilical vesicle attached to the chorion. The cœlom is filled with a considerable quantity of magma reticulare. The walls of the vesicles are fibrous and thickened, and between them there is a thickened mesoderm. The tissues of the vesicles and their cavities are filled with a considerable number of migrating cells. Figs. 1870–1872 show all the layers of the embryonic mass in their normal position with two large blood-vessels embedded in the mesoderm. In the embryonic stalk the blood-vessels unite into a single trunk. There is no heart. The stage of this specimen is midway between Graf Spee's v. H. and Gle., and a little earlier than the embryo Eternod [14] has described recently. This specimen shows also that the blood-vessels filled with blood may grow to the chorion before the heart has even existed. This fact is not remarkable when considered in connection with our knowledge of the growth of the blood-vessels from the umbilical vesicle to the body of the embryo to form the heart. Furthermore, Loeb [15] has shown recently that when the heart of embryo fishes is poisoned with KCl a complete set of blood-vessels is developed without any circulation whatever. The fact that blood-vessels may grow into the villi of the chorion without the presence of circulation or blood corpuscles and the great power the blood corpuscles possess to wander through any of the tissues of the embryo, exclude to a great extent the mechanical idea of the first formation of the blood-vessels.

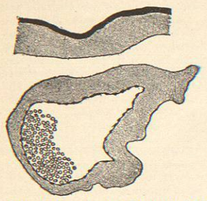

FIG. 1870. — Section through the Umbilical Vesicle and Chorion of Specimen No. XIII., His' No. XLIV. Blood corpuscles are within the cavity of the vesicle. × 30 times.

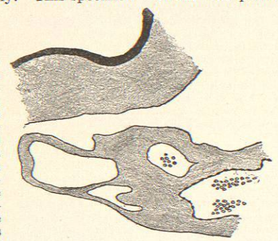

FIG. 1871.—Section through the Amnion, Jugular Veins, Umbilical Vesicle, and Chorion of XIII. × 30 times.

The beginning of the arrest of development in specimen XIII. must have taken place after the amnion was completely formed. Had it continued to grow it might have produced an embryo like CXV. described above. An earlier stage could hardly have done this, so we find in No. XIII. an intermediate stage between the nodular and atrophic abnormal embryos.

One of the most remarkable specimens which may be discussed in this connection is No. CXXXIV. From external appearances the ovum cannot be over seventeen days old. A few days before the abortion took place the ovum was punctured and a clot of mother's blood formed within the cœlom. The activity of the leucocytes was terrific, for they encircled the embryo, entered its tissues, and invaded the chorion. We can fairly presume that the embryo was infected with mother's blood somewhere in the neighborhood of the twelfth day of pregnancy, and that its development was partly arrested at that time. Within the ovum there is a large vesicle which is collapsed (Fig. 1873). It is attached to the chorion by means of a firm pedicle. The blood-vessels of the embryo reach to the chorion and enter the villi immediately over the attachment of the pedicle to the chorion. In addition to the reaction between the leucocytes of the mother and the cells of the embryo the most remarkable thing is the arrangement of the germ layers.

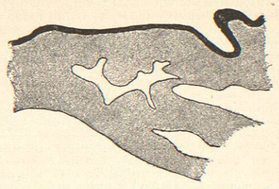

FIG. 1872.—Section through the Umbilical Vesicle as It Joins the Chorion in No. XIII. × 30 times. The large irregular space in the chorion is a blood space which communicates with the veins of the embryo.

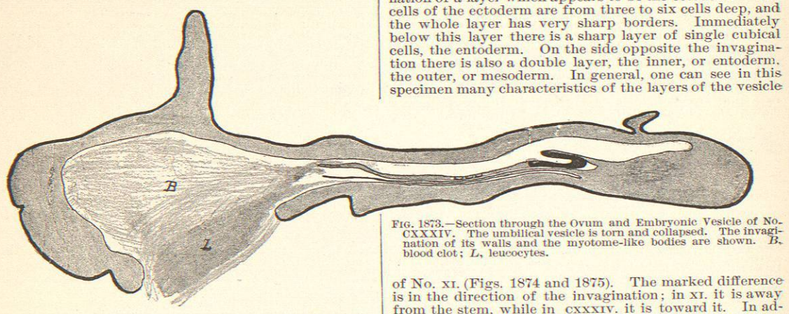

FIG. 1873.—Section through the Ovum and Embryonic Vesicle of No. CXXXIV. The umbilical vesicle is torn and collapsed. The invagination of its walls and the myotome-like bodies are shown. *B*, blood clot; *L*, leucocytes.

Fig. 1873 shows in general the collapsed vesicle, composed mostly of two layers with a deep and short invagination of a layer which appears to be the ectoderm. The cells of the ectoderm are from three to six cells deep, and the whole layer has very sharp borders. Immediately below this layer there is a sharp layer of single cubical cells, the entoderm. On the side opposite the invagination there is also a double layer, the inner, or entoderm, the outer, or mesoderm. In general, one can see in this specimen many characteristics of the layers of the vesicle of No. XI. (Figs. 1874 and 1875). The marked difference is in the direction of the invagination; in XI. it is away from the stem, while in CXXXIV. it is toward it. In addition, the ectoderm lining the invagination of embryo CXXXIV., the mesoderm on the side near the blood clot, is arranged in a peculiar manner, suggesting myotomes.

There are five of them, and they are surrounded with embryo blood as well as leucocytes. The wrong direction of the invagination of the ectoderm, and its wrong relation to the "myotomes," make it extremely difficult to interpret this specimen. I am inclined to the opinion that the clot of blood arrested the development of the embryo when it was in the stage represented by No. XI., but that the parts continued to grow, shifting the layer into this abnormal position. The amnion did not close, the blood-vessels of the embryo failed to form a heart, but continued to grow in all directions through the walls of the vesicle, its stem, the chorion and some of its villi. The mesoderm continued to develop for a while and produced aborted myotomes.

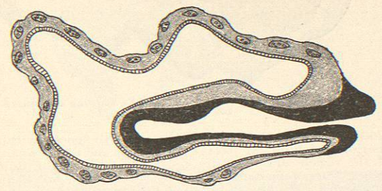

FIG. 1874.—Section through the Umbilical Vesicle and its Invagination of Specimen No. XI. × 50 times. The three layers correspond with the ectoderm, mesoderm, and entoderm. The invagination marks the cavity of the amnion.

A specimen similar to the experimental embryo CXXXIV. is No. XI. This specimen has been described in detail in the *Journal of Morphology*, vol. xii., and in the Johns Hopkins Hospital Reports, vol. ix. At that time I used this specimen as a basis upon which to construct a theory of the formation of the amnion. The general arrangement of the layers is given in Figs. 1874 and 1875. Entoderm within, mesoderm with blood-vessels in the middle, and a thick ectodermal plate on the outside. A deep invagination of all three layers is the amnion. A sharp allantois is within the stem.

Specimen LXXXVII., Figs. 1876 and 1877, corresponds with XI. as well as with CXXXIV., which is an experiment upon a normal embryo. The age of this specimen is about in the neighborhood of two and a half to three weeks, judging by a normal embryo which was within this same ovum. The large vesicle I believed at first to be the umbilical vesicle of the embryo present in the ovum, but sections of them both showed that the embryo had its own normal umbilical vesicle, while the additional vesicle showed marked alterations. Its walls are made up of three distinct layers—an outer, composed of cylindrical cells; a middle, in which are located blood islands; and an inner composed of flat cells. With the exception of its thickened walls, it appears as a normal umbilical vesicle which is inverted. The outer epithelial layer does not cover the entire vesicle. On one side there is a deep invagination of all three layers, as shown in the figures.

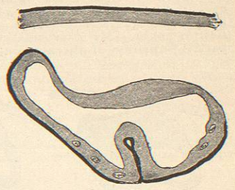

FIG. 1876.

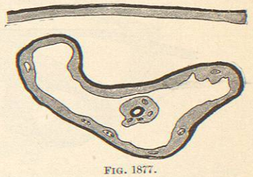

FIG. 1877.

FIGS. 1876 and 1877.—Sections through the Vesicle and Chorion of Specimen No. LXXXVII. × 25 times. A deeper portion of the invagination in Fig. 1876 is shown cut in cross section in Fig. 1877. Blood islands are in the mesoderm.

The presence of this vesicle, in addition to a normal embryo within the ovum, is in itself remarkable. I am inclined to interpret it as an abnormal second embryo. The invagination brings it in line with the embryos described above. Remarkable is it that the outer layer is so extensive, that the invagination is so small, and that blood islands are included in the walls of the invagination.

Closely related to LXXXVII. is specimen LVIII., Figs. 1878 and 1879. The mesoderm of the vesicle, pedicle, and chorion is fibrous and decidedly abnormal in appearance. Within the pedicle there are a few large blood islands.

FIG. 1875.—Section through the Stem Uniting the Umbilical Vesicle with the Chorion in No. XI. × 50 times. The cavity within the stem lined with epithelium is the allantois.

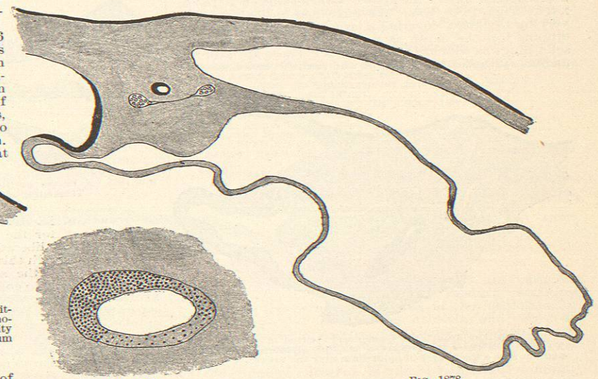

FIG. 1878.

FIG. 1879.

FIG. 1878.—Sections through the Vesicle and its Attachment on the Chorion from Specimen No. LVIII. × 10 times. Within the stem there is a sharply defined cavity lined with epithelium and an hour-glass-like space filled with blood. On one side the stem is covered with epithelium.

FIG. 1879.—The Cavity of the Stem, shown in Fig. 1878, enlarged 50 times.

In the neighborhood of them there is a space lined with a sharp layer of epithelial cells which might be interpreted as an arrest of development of a stage like Graf Spee's v. H. On the outside of the pedicle, however, there is a distinct layer of epithelial cells, which brings this specimen in harmony with the others described above. My interpretation of this specimen is a partial formation of the amnion with most of the ecto-

FIG. 1880.

FIG. 1881.

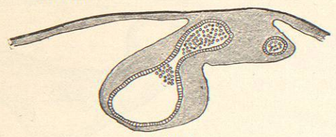

FIG. 1882.

FIGS. 1880, 1881, and 1882.—The Sections through the Vesicle and Chorion of No. LXXVIII. × 10 times. Blood within the cavity of the vesicle. The stem is partly covered with epithelium and there is a double amnion, shown in Fig. 1880.

derm on the outside of the vesicle. A similar condition is found in specimen LXXVIII., Figs. 1880–1882. Here again there is an epithelial layer around the periphery of the stem with a double amnion lined with high epithelium just beneath it (Fig. 1880). There are also blood islands in the mesoderm of the pedicle. Much more marked than any of the above is the condition found in XXIV., Figs. 1883–1885. We have here an ectoderm of varying thickness covering a large share of the vesicle, dipping into the depth at numerous points to produce solid plugs as well as invaginations. There are also numerous epithelial tubes within the pedicle which do not

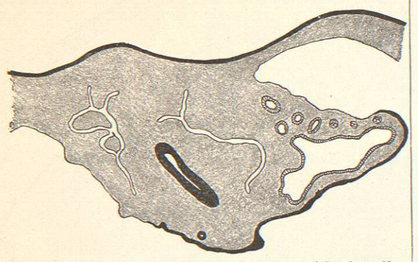

FIG. 1883.—Section through the Vesicle and Chorion of Specimen No. XXIV. × 25 times. There are a multiple allantois and multiple amnion with a thick layer of epithelium over the vesicle.

communicate with the outer epithelial layer. In this specimen we again have multiple amnion made intelligible from all of the specimens just described.

In addition to the specimen in which the amnion is either partial or multiple, we have in XIV., Figs. 1886 and 1887, a specimen without any amnion whatever. The vesicle is covered with a layer of epithelial cells (ectoderm) which has fallen off in part. There are a few

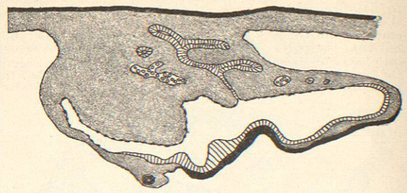

FIG. 1884.—Deeper Section through No. XXIV., showing the Branching Allantois.

blood islands present. There are also two spaces in the chorion which do not communicate with the main cavity of the vesicle and they are lined with a layer of thin cells. These may be remnants of the amnion, but their appearance differs so from the amnion in other specimens that I am not inclined to accept such an explanation. Below them, embedded in the chorion, there is a nest of syncytial cells.

With the hypothesis that the epithelial covering of the vesicle and the epithelial tubes in the stem are derived from the ectoderm, all of these pathological specimens of the vesicular form can be explained. I have constantly compared them with numerous sets of serial sections of normal umbilical vesicles of all ages, and have never found this epithelial covering of the umbilical vesicle of the normal embryo like that in the pathological. In one instance the umbilical vesicle of a pathological embryo of the fourth week (XCVII.) is covered with a layer of epithelial cells.

While we have all variations in the growth of the ectodermal covering of the vesicle, we also have variation in

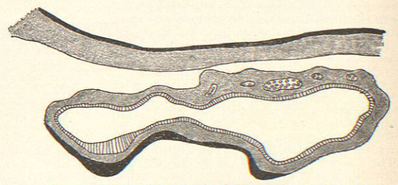

FIG. 1885.—A Deeper Section of the Vesicle, showing the Irregular Thickening of the Ectoderm and Entoderm.

the growth of its entodermal lining. In general, there is a tendency for the pedicle of the vesicle to become destroyed, thus liberating the vesicle from the chorion. Hand-in-hand with this process there is an arrest of the development of the allantois. Usually there is none. My inclination is to consider the cavity in the pedicles of XIV. and XXI., Fig. 1886, as the allantois which has been separated from the umbilical vesicle. Yet this is only an opinion. In specimen LXXVIII. the cavity of the umbilical vesicle extends well into the chorion (Fig. 1882), and this condition may be viewed as dilatation of the allantois. In specimen XXIV., Figs. 1883, 1884, with the multiple amnion, we also have a multiple allantois. Its branches subdivide many times, as the figures show.

In all the pathological specimens there are blood islands in the pedicle. This fact establishes the meaning of the vesicle. It is the remnant of the embryo and its umbilical vesicle. From it the blood-vessels grow to the cho-

rion, and in all the pathological specimens of vesicular form they do not reach it. The same statement applies to all ova in which the embryo was destroyed at an early

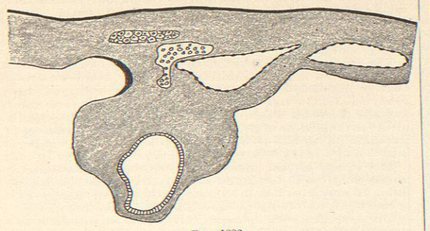

FIG. 1886.

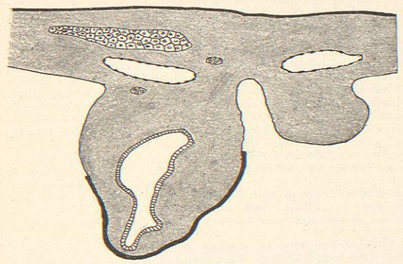

FIG. 1887.

FIGS. 1886 and 1887.—Section through the Nodule (Vesicle) of Specimen No. XIV. × 25 times. A few blood islands are within the stem as well as an enclosed mass of syncytium. These are also still in the chorion. The nodule is covered with a layer of epithelium which has fallen off at points.

date. If the embryo is fairly well formed before it started to disintegrate, there are blood-vessels with or without blood in the chorion.

What I have called umbilical vesicle is undoubtedly, in some instances, what Giacomini calls amnion in his earlier communications. The presence of blood-vessels is the main evidence for my calling these vesicles umbili-

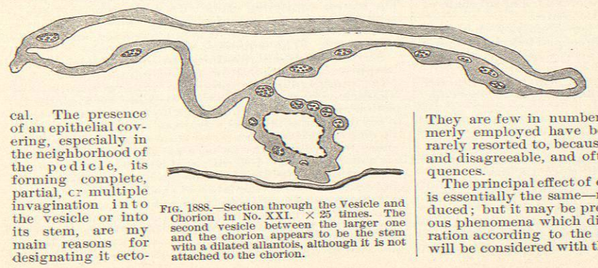

FIG. 1888.—Section through the Vesicle and Chorion in No. XXI. × 25 times. The second vesicle between the larger one and the chorion appears to be the stem with a dilated allantois, although it is not attached to the chorion.

cal. The presence of an epithelial covering, especially in the neighborhood of the pedicle, its forming complete, partial, or multiple invagination into the vesicle or into its stem, are my main reasons for designating it ecto-dermal. Other observations, enumerated above, also speak for this interpretation.

A single vesicle just separated from the chorion is found in No. CXXIII., Fig. 1889. This vesicle is completely separated from the chorion with its pointed end opposite a pointed mound within the chorion showing its original connection. A similar vesicle is in specimen CXXX., but the communication may have broken off. Another specimen of the same kind is CXLVII. The vesicle is fully separated from the chorion and is partly covered with a very thick mesoderm in which are blood-vessels filled with blood. There are blood-vessels in the chorion in the immediate neighborhood of the vesicle, showing that at one time the vesicle must have been connected with it.

A unique specimen is shown in No. CXLIII. There are two large vesicles which do not communicate and are

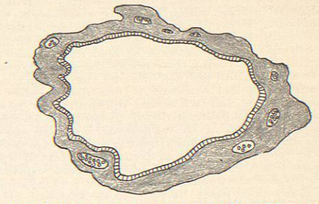

FIG. 1889.—Section through the Vesicle of No. CXXIII. × 25 times. Entoderm, mesoderm, and blood islands are shown.

connected with the chorion. The structure of their walls could not be made out, as the specimen had been in alcohol many years. The vesicles seem to represent the amnion and umbilical vesicle.

The primary affection in the vesicular forms seems to be in the neighborhood of the pedicle. At this point all the forces come together. Through it the blood-vessels meet the chorion. Into it the amnion and allantois grow. So it is natural that forces which overthrow the development of an early embryo must express themselves at this point.

Franklin P. Mall.

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EMETICS are medicines used to produce vomiting. They are few in number. Some of the medicines formerly employed have become obsolete, and others are rarely resorted to, because their emetic operation is harsh and disagreeable, and often followed by injurious consequences.

The principal effect of emetics, the process of vomiting, is essentially the same—no difference by what means induced; but it may be preceded and followed by numerous phenomena which differ greatly in intensity and duration according to the agent used. These phenomena will be considered with the individual emetics. Here we