firmed their equality. The most important uses of cod-liver oil, moreover, are observed in a series of cases whose pathology is as obscure as the action of the remedy—such as the "scrofulous" diseases, whether glandular or ulcerative, chronic rheumatism, etc. It must in these cases act in some gentle and peculiar way upon the pathological processes, tending to return them to normal physiological ones, and in this respect is to be classed in the heterogeneous number of medicines called alteratives. Its uses have been mostly noticed in the preceding sentence but may be recapitulated a little more in detail. It is given, more than in any other disease, in phthisis pulmonalis. The long, wasting course of this complaint calls very distinctly for remedies that will prevent waste on the one hand, and promote nutrition on the other. Alcohol and cod-liver oil may be regarded as types of these two therapeutic agents, and experience has long ago shown them to be two of the most generally useful things that can be given. Neither is a specific, neither appears in the slightest degree to change the character of the poison lying at the root of the complaint, but both retard the loss of flesh and strength, each in its peculiar way. The oil is often given alone in the early stages of the disease, and generally with advantage, as alcohol in small doses more readily loses its effect. It is also frequently combined with malt extracts, the hypophosphites, iron, iodine, and other alteratives or aids to nutrition. Besides the general action, the oil has an undoubted favorable effect upon the chronic bronchitis and catarrhal pneumonia present, and it is therefore of value in the cough of consumption. It is also of great service in subacute and chronic idiopathic bronchitis ("colds in the chest"). In the persisting colds of infants and the aged, with a good deal of weakness, it has no equal. In chronic catarrh of various mucous membranes, ear, nose, vagina, urethra, etc., especially if attended with, or depending upon, debility, it is sometimes useful. In hip disease, and similar degenerations of other joints; in glandular abscesses, in chronic ulcers; in short, wherever there are waste, emaciation, and thinness of blood, it is to be tried. A peculiar method of its employment in the fisheries is in half-tumblerful doses, to break up an acute cold.

The great obstacles to the fullest use of cod-liver oil are its taste, which is so repugnant to many that they can scarcely take it, and its liability to disagree with the stomach, and either to produce nausea and vomiting, or, what is equally disastrous, to impair the appetite and so to more than undo all its possible benefit. The different methods of administration mentioned below sometimes overcome this, but most important is the exclusive use of the carefully prepared and nearly tasteless oils referred to above.

ADMINISTRATION.—The dose of the oil is from 12 to 30 c.c. (ʒ iij. ad ℥ i.) two or three times a day. If it can be taken clear it may be so given; the taste, even of the best, is somewhat repulsive, and becomes more so toward the last of the bottle in summer, as it rather easily becomes rancid. It is best, therefore, to purchase only a small quantity at a time, and to keep it as cool as possible. The taste may be disguised by means similar to those used with other oils (*e.g.*, *Castor Oil*, *q.v.*): rinsing the mouth thoroughly with whiskey, spirit of lemon, peppermint, or some such pungent vehicle; swallowing the oil at once, and again rinsing the mouth, is as good as any of the extemporaneous means used for this purpose. The liquor, if one prefers to do so, may be spit out. Large elastic capsules containing 6 or 8 gm. (ʒ i. to ij.) are made, but not much used, on account of their expensiveness. The following combination, when liquor is to be given with it, is a well-known favorite:

Cod-liver oil	50 parts.
Whiskey	35 "
Comp. tincture of lavender	15 "

It must be thoroughly shaken for every dose, as the oil immediately begins to separate. The lavender is added only as a flavor, and may be omitted. All oils appear to be less offensive to children than to adults.

Another method is to mix the oil with about an equal part of one of the syrupy malt extracts; the mixture does not separate so readily as the above. Its taste is well borne by children. Then there are the numerous emulsions made and advertised everywhere. They come under one of the following classes: First, mucilage emulsions, of which the following is an example:

Cod-liver oil	50 parts.
Oil of wintergreen	2 "
Mucilage of tragacanth	15 "
Water of orange flowers, sufficient to make	100 "

A little "knack" is required to make it well. The mucilage is the emulsifying agent, and the oil should be added to it very slowly, and *most thoroughly stirred until it is divided into invisible particles*, before the water is added. The oil of wintergreen is only a flavor, which may be varied to suit. This makes a good, permanent mixture of about the consistence and appearance of thick cream. Instead of tragacanth, mucilage of acacia, about twice the amount, or a decoction of Irish moss, may be used.

Second, egg emulsions: These are made like salad dressings, by using the yolk of egg as the suspending ingredient. The following is a good one:

Cod-liver oil	50 parts.
Oil of sassafras	3 "
Chloroform	2 "
Glycerite of yolk of egg	10 "
Rose water, enough to make	100 "

Here the oil and the egg must first be "emulsified," when the other ingredients may be added—the water last. This is a thinner liquid than the preceding.

The pancreatic emulsions are nominally made by emulsifying with pancreatin, and are theoretically the most perfect of all, but are practically attended with some difficulty; the ordinary "pancreatin" of the shops will not make a good result, and of those claimed to be so produced some are made by means of added alkalies, others by the fresh pancreas itself, and some do not even contain any cod-liver oil at all. Considerable care has to be exercised with all proprietary preparations, to see that the percentage of oil is not deficient, as the drawing out of the oil is a favorite method of rendering the preparation palatable. An ounce or two of perfectly sweet pancreas, chopped fine and mixed thoroughly with a gallon of oil, will, it is said, suffice, when the oil is filtered off and mixed with water, to emulsify it perfectly. Like the other emulsions, it can be flavored to taste. Iodine, iron, the hypophosphites, and other suitable additions can be made to all of them, but alcohol and tinctures are incompatible with the mucilaginous ones. If the patient would chew a bit of raw smoked herring before taking the oil, its taste would not be noticed.

The "wines," and similar preparations, of cod-liver oil, under whatever fanciful names, are utterly unreliable and are to be classed as unscientific.

Morrhuol is an alcoholic extract of the oil. Very little is yielded by fresh sweet oils, and the yield increases with the degree of putridity of the article. It is therefore to be regarded as essentially a putrefactive product, and whatever useful properties it may claim to possess, it need not be used for the effects of the oil.

Cod-liver oil is often given by inunction, with benefit, especially to marasmic babies. *W. P. Bolles.*

CŒLOM, COMPARATIVE DEVELOPMENT OF THE.—In all vertebrates the primitive intestine forms two sets of diverticula which are destined to become permanent tissues, (1) one toward the medullary groove which forms the chorda dorsalis, and (2) two lateral diverticula which form the body cavities. These latter are later on

subdivided into pleural, pericardial, peritoneal, and other cavities. A detailed description of the theory of the formation may be found in Balfour's work, in Hertwig's "Embryologie," and in Minot's "Human Embryology."

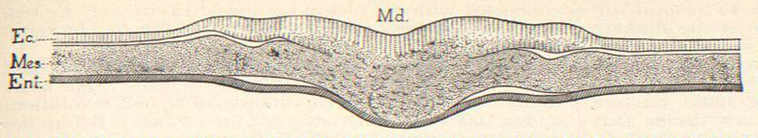

FIG. 1390.—Transverse Section through the Posterior Region of a Chick, with Six Pairs of Myotomes. (After Waldeyer, from Minot.) *Ec.*, ectoderm; *Mes.*, mesoderm; *Ent.*, entoderm; *Md.*, medullary groove.

When sections are made through very young embryos of higher vertebrates, just after the blastodermic membranes are well formed, a solid mesoderm is found, as shown in Fig. 1390. Although in lower vertebrates the mesoderm is produced by lateral diverticula from the entoderm, which are hollow from the beginning, in higher vertebrates the mesoderm is first laid down as a solid mass of cells. Soon the cells of the mesoderm on either side of the chorda divide into two layers, the somatopleure and the splanchnopleure (Fig. 1391, *Som.* and *Spl.*). From the two lateral cavities between these two layers the peritoneal cavity is formed.

The more accurate early formation of the pleuro-peritoneal cavity, in its relation to the other organs, we find carefully studied by Budge, who by means of injection followed it in the chick. With a fine hypodermic syringe he filled the various spaces of the cœlom as they appeared, thus showing very clearly the extent of this cavity in various embryos. The splanchnopleure, according to Budge, may be split into two layers, a dorsal or lymphatic and a ventral or vascular. As the first blood-vessels are formed, lymph vessels appear on their dorsal side, which flow together to form networks and accompany the primitive veins to the axial part of the germinal area. Here the lymphatics form two spaces, one on either side of the body, which are soon united by a bridge, or rather duct, on the ventral side of the heart. Therefore, in birds at least, the primitive pleuro-peritoneal cavity appears somewhat as an **H**, the uprights of which are on either side of the body, and the cross-piece on the oral side of the sinus venosus. In its further development the sinus venosus grows to the dorsal side of the cross piece, thus reversing the relation of the vascular system to the lymphatic, or rather cœlomic system. The uprights of the **H** fall to the outside of the body and are swallowed up in the formation of the amnion. Fig. 1392 is a cross-section from a chick at this stage, and shows that the greater portion of the cavity is now on the outside of the body. The cross-piece of the **H** is immediately on the ventral side of the heart, and forms the cavity of the pericardium by the heart growing into it. Its communication with the remaining cœlomic cavity is later on cut off in higher vertebrates, while in lower veretebrates it may remain open.

According to Budge two diverticula grow from the cross-piece, one on either side of the chorda, toward the tail of the body, and form the primitive pleuro-peritoneal cavities. Budge's paper was published from fragmentary notes after his death, and I am certain that the above statement is not correct. Professor His has placed before me Budge's specimens, which I think show conclusively that the interpretation of his injections is not correct. Most of his injections were made into the amniotic fold as the amnion was forming. Cross-sections of embryos show that on either side there is a large cavity (Fig. 1392, *Som.*) which communicates freely with the pleuro-peritoneal (*Coe*). Before the amnion is complete we have lateral cavities on either side of the body, communicating with each other only by means of the cross-piece on the ventral side of the heart. This is the freest portion of the communication, which also communicates most freely with the pleuro-peritoneal cavities.

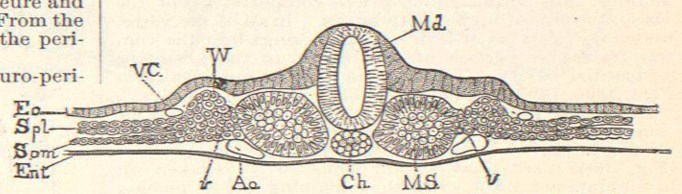

FIG. 1391.—Transverse Section of a Chick of the Second Day. (After Waldeyer, from Minot.) *Som.*, Somatic mesoderm; *Spl.*, splanchnic mesoderm; *Ec.*, ectoderm; *Ent.*, entoderm; *V.C.*, vein; *W.*, Wolffian duct; *Md.*, medullary canal; *Ao.*, aorta; *Ch.*, chorda; *M.S.*, myotome.

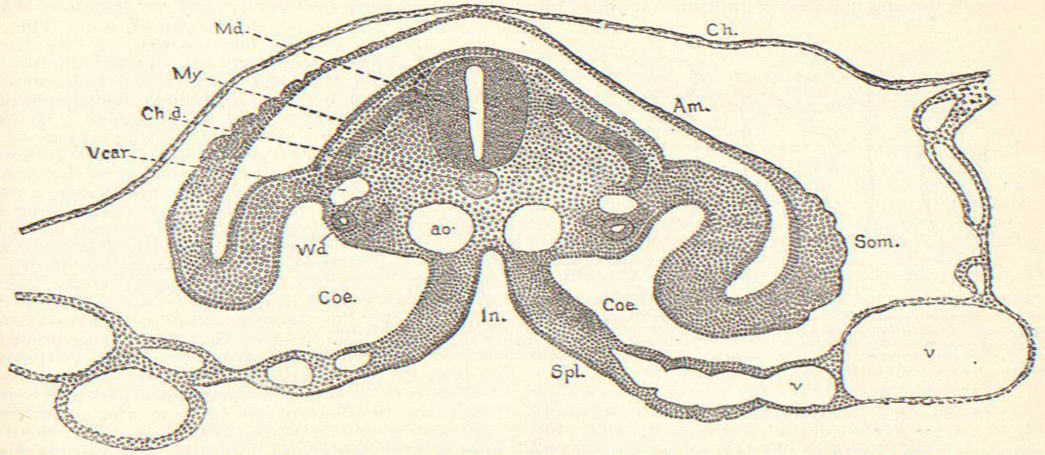

FIG. 1392.—Section through the Body of a Chick of the Third Day. (After Minot.) *Ch.*, Chorion; *Am.*, amnion; *Som.*, somatopleure; *v.*, blood-vessels; *Coe.*, cœlom; *Spl.*, splanchnopleure; *In.*, intestine; *ao.*, aorta; *Wd.*, Wolffian duct; *Vcar.*, vena cardinalis; *Ch.d.*, chorda dorsalis; *My.*, myotome; *Md.*, medullary canal.

(Fig. 1392, *Coe*). In many embryos the injection passed from the cross-piece into the pleuro-peritoneal cavity and would not extend out into the amniotic portion of the cœlom, thus making it appear as if the pleuro-peritoneal cavities were, so to speak, diverticula projecting directly from the cross-piece or pericardial cavity. Transverse sections, however, give the picture of Fig. 1393. Surface views could not decide that these two cavities united directly, and these sections were no doubt made after the writing of the rough draft of his manuscript. Therefore, instead of stating that the two pleuro-peritoneal cavities arise as independent diverticula, we must say that they are pinched off from the cœlomic cavity after the amnion is formed.

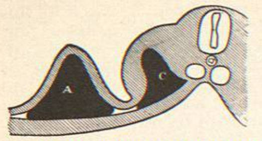

FIG. 1393.—Section of a Chick, to show that the Pleuro-peritoneal Cavity is cut off of the Cœlomic, leaving a Portion in the Amnion. The embryo has been injected, but the fluid of the two cavities has not flowed together.

The cœlomic cavities which are so intimately united with the lymphatic system unite and again divide into sections, thus forming the various compartments of the visceral cavity of higher vertebrates. In all of the vertebrates the heart, as it is developing, hangs into the ventral transverse portion of the cavity, or the primitive pericardial cavity. This is shown diagrammatically in Figs. 1394, 1395, 1396, and 1397, *P*.

Figs. 1394 to 1397 show the very early condition of things; the cœlomic cavities are united by the cross-piece or the primitive pericardial cavity. The dotted lines (Fig. 1394) mark what portion of the cavity is taken up in the amnion (*A.P.*), while the remaining middle portion (*P.P.*) becomes the pleuro-peritoneal. Figs 1395, 1396 and 1397 show in succession the more advanced stages. In higher vertebrates the pericardial cavity is completely closed off from the pleuro-peritoneal, but in elasmobranch fishes a communication between them exists in the adult. The separation of the pericardial cavity from the pleuro-peritoneal is aided materially by the heart growing over to the ventral side of the body, as shown in Fig. 1398. Sections through various parts of the same embryo, from which Fig. 1398 is taken, are shown in Figs. 1399 to 1404. In none of these sections is the communication between the pericardial and pleural cavities shown, but sections nearer the head contain it.

A cast of the cœlomic cavity of this same embryo is given in Fig. 1405. There is only a slight communication between the pericardial cavity and the pleuro-peritoneal. The groove in the cast marked *M* indicates the position of the simple mesentery. Its relation to these organs is better shown in the sections (Figs. 1399 to 1404). Fig. 1406 represents a section through a chick at an earlier stage of development, in which the duct communicating between the pericardial and pleural cavities is cut longitudinally.

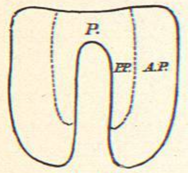

FIG. 1394.

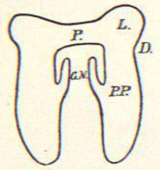

FIG. 1395.

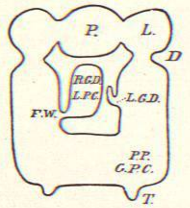

FIG. 1396.

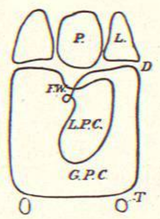

FIG. 1397.

FIGS. 1394, 1395, 1396, and 1397.—Diagrams to Show the Development of the Cœlomic Cavity. *P.P.*, Pleuro-peritoneal cavity; *A.P.*, portion of the cœlomic cavity swallowed up in the amnion; *P.*, pericardial cavity; *L.*, pleural cavity; *G.N.*, gastric diverticula, right and left; *D.*, position of the diaphragm; *L.G.D.*, left gastric diverticulum; *R.G.D.*, right gastric diverticulum or lesser peritoneal cavity; *F.W.*, foramen of Winslow; *G.P.C.*, greater peritoneal cavity; *T.*, tunica vaginalis.

Thus it is seen that the heart first grows into the primitive pericardial cavity, which is nothing else than the cross-piece of the **H** already spoken of. The pericardial cœlom grows larger and larger, at the same time hanging as it were over the ventral side of the body, and is soon connected with the pleuro-peritoneal cavity only by two ducts, which later on become closed in the higher vertebrates.

In early embryos the veins enter the heart behind, and not in front, as is the case in higher animals. The heart in its whole development undergoes a half-revolution, and in this way the twists, etc., are formed. Before the pericardial cavity is shut off from the pleuro-peritoneal

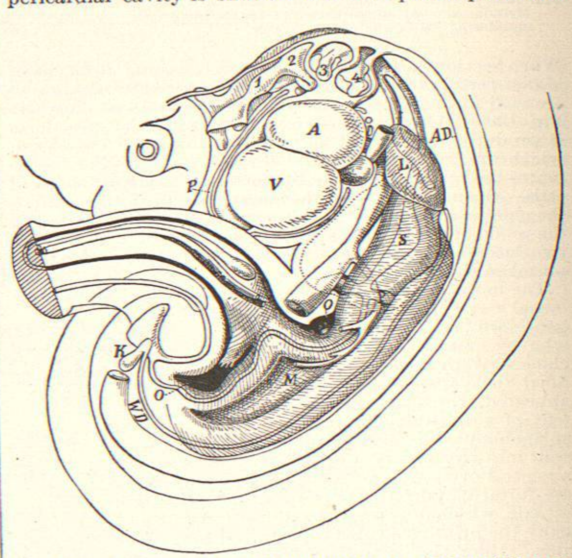

FIG. 1398.—Reconstruction of a Human Embryo. (Enlarged 16 times, viewed from the left side.) *P.*, Pericardial cavity; 1, 2, 3, and 4, branchial pockets; *A.D.*, descending aorta; *A.*, auricle; *V.*, ventricle; *L.*, lung; *S.*, stomach; *P.*, pancreas; *M.*, mesentery; *K.*, kidney; *W.D.*, Wolffian duct; *O.*, openings through which the right and left peritoneal cavities communicate.

the large vessels enter from behind. They are embedded in a mass of mesoblastic tissue which is encroaching upon the pleuro-peritoneal cavity, and has been termed by His the transverse septum. This, by its further growth, forms the diaphragm of higher animals (Figs. 1395, 1396, 1397). In lower animals only a rudimentary diaphragm, or none at all, is present. By the formation of the diaphragm the pleuro-peritoneal cavity is divided into a smaller anterior portion, the pleural, and a larger posterior portion, the peritoneal. The lungs now grow into the pleural, as shown in an early stage in Fig. 1406, and in a somewhat later stage in Fig. 1399.

The peritoneal cavity is at first composed of two distinct portions, one on either side of the intestine, which in lower animals is quite a straight tube, lying in the middle line of the body. Soon, however, two communications are found between the two halves, one in front and one behind the omphalo-mesenteric vessels (Fig. 1399, *O*). These openings enlarge more and more as the intestine becomes more convoluted, and soon flow together, severing completely the omphalo-mesenteric vessels and duct. A por-

tion of the duct may, however, remain in connection with the small intestine to form the diverticulum of Meckel.

As the organs grow the peritoneal cavity surrounds them more or less completely, until the condition of things as seen in the adult is produced.

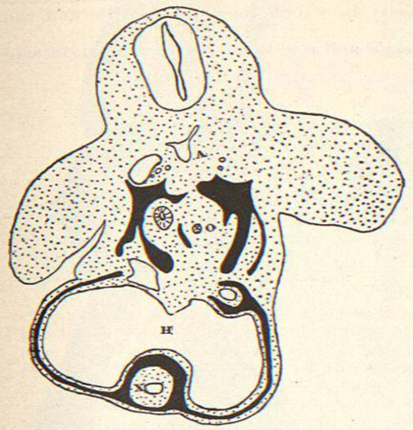
FIG. 1399.

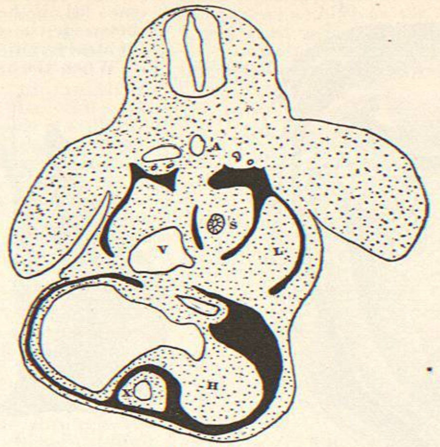
FIG. 1400.

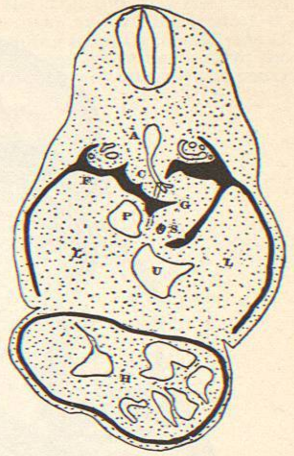
FIG. 1401.

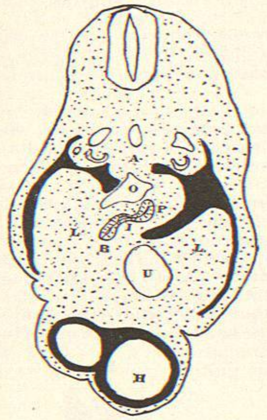
FIG. 1402.

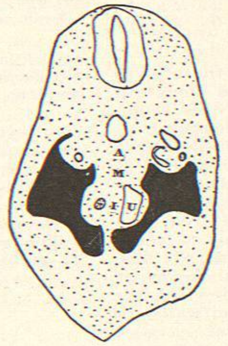
FIG. 1403.

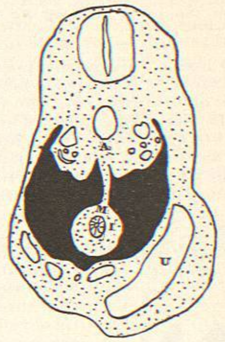
FIG. 1404.

FIGS. 1399-1404.—Sections through a Human Embryo Twenty-six Days Old. (× 25 times.) *O.*, Œsophagus; *S.*, stomach; *I.*, intestine; *P.*, pancreas; *B.*, bile duct; *A.*, aorta; *C.*, cœliac axis; *G.*, right gastric diverticulum; *F.*, foramen of Winslow; *M.*, mesentery; *L.*, liver; *P.*, portal vein; *U.*, umbilical vein; *H.*, heart; *X.*, bulb of the aorta. The pleuro-peritoneal cavity is colored black throughout.

In lower vertebrates the peritoneal cavity remains quite simple, but in reptiles, birds, and mammals it may become quite complex. Especially is this true regarding the birds, in which these divisions are greatly complicated by the growth of the air sacs from the lungs.

The first trace of the lesser peritoneal cavity is seen in the reptiles. Ravn has shown that in the lizard there are two diverticula from the peritoneum, one on either side of the stomach. From the one on the right side the lesser peritoneal cavity of mammals arises. In general the relation of the lesser peritoneal cavity to the greater is much like what is shown in Fig. 1395. In the true sense of the term there is no lesser cavity, but only the two pouches. These are already present in the embryo, and in the adult they retain their embryonic appearance.

In birds the conditions become more complex. They appear in the chick during the third day of incubation. A section of the chick at this stage is given in Fig. 1406, *G.D.*, making the lesser cavities, or, as they may better be termed, the right and left gastric diverticula. At the beginning of the fourth day the gastric diverticula become larger, and on transverse section semicircular. Figs. 1407 and 1408 are from casts of the cavities about the stomach of a chick of eighty-eight hours. The right is larger than the left and is markedly cup-shaped, and connects by means of a narrowed opening with the right pleuro-peritoneal cavity (Fig. 1407, *F. W.*). The two together enclose the proventriculus. On account of the relations of the opening of the right diverticulum with the blood-vessels, stomach, and liver, and also for reasons which find their basis in comparative anatomy and embryology, the opening can be nothing else than the foramen of Winslow.

On the left side the gastric diverticulum is much smaller, and in older embryos it disappears altogether.

In a chick of five days and sixteen hours (Fig. 1409) the right gastric diverticulum has about doubled all its dimensions, while the embryonic foramen of Winslow has become much more sharply defined. At this time the liver has greatly increased in size, the right lobe being larger than the left, both lying anterior to the foramen of Winslow. The original position of the liver being behind the foramen, its rotation necessarily carries the hepatic artery and the portal vein around the fora-

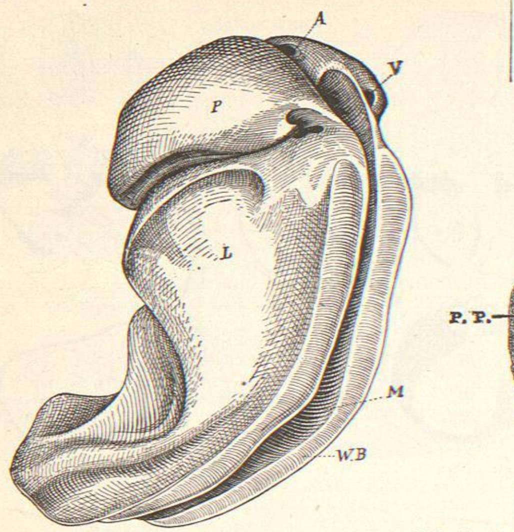

FIG. 1405.—Corrosion Preparation of the Pleuro-peritoneal Cavity of an Embryo Twenty-six Days Old. (× 22 times.) *P.*, Pericardial cavity; *A.*, opening for the aorta; *V.*, opening for the vein; *L.*, space over the liver; *M.*, slit for mesentery; *W.B.*, space for Wolffian body.

men of Winslow—its adult position. With the growth of the gizzard a space extends from behind the right gastric diverticulum along the dorsal side of this organ, and marks the beginning of the cavity of the great omentum (*O.*). Nearly the whole of the right diverticulum now lies on the left side of the body; the same position is held by the proventriculus and the gizzard.

The domestic fowl possesses three peritoneal cavities, completely separated from one another, and from one of them the lesser cavity arises. The communication is by means of the foramen of Winslow. After the anterior abdominal walls are removed, two ventral cavities are exposed, separated from each other by a vertical longitudinal septum. Into each of the cavities hangs a lobe of the liver, while into the left the ventral surface of the gizzard projects. On the dorsal side of the liver there are, on each side, three air sacs — an anterior, a middle, and a posterior. The middle one is the smallest, and the posterior the largest, extending as it does throughout the posterior portion of the abdominal cavity. Each sac communicates by means of a special opening directly into the lungs. By allowing the sacs to collapse we find that a very distinct membrane projects backward from the gizzard and cuts off the portion of the abdominal cavity containing the intestines. This is the "pseudo-epiploön" described by Weldon and followed more extensively by Bed-

FIG. 1406.—Section through the Region of the Heart of a Chick of Seventy Hours. (× 35 times.) The section strikes the oral end of the gastric diverticulum *G.D.*, and the tips of the pulmonary buds, *L.* A few sections deeper the gastric diverticula communicate with the pleuro-peritoneal cavity. *H.*, heart; *D.C.*, ductus Cuvieri; *B.A.*, bulbus aortæ.

derd. A similar membrane is present in the crocodile. In all respects, this membrane is situated in the same position as is the epiploön in mammals, with the difference that it is adherent to the abdominal walls along its free border. On the dorsal side of the gizzard the air sacs fill all the space, thus closing off the communication between the cavity in which the intestines lie and the ventral cavities.

When the anterior and middle air sacs on the right side

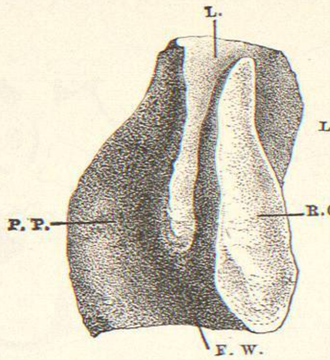

FIG. 1407.

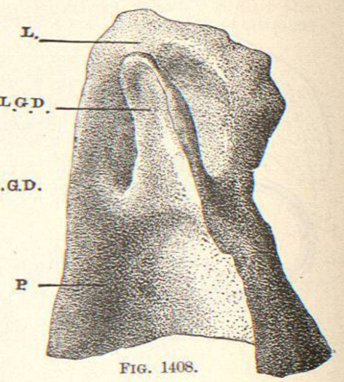

FIG. 1408.

FIGS. 1407 and 1408.—Corrosion Preparations of the Right and Left Gastric Diverticula of a Chick Eighty-eight Hours Old. (× 33 times.) *P.P.*, Pleuro-peritoneal cavity; *R.G.D.*, right gastric diverticulum; *L.G.D.*, left gastric diverticulum; *L.*, position of lung; *F.W.*, foramen of Winslow.

are separated from the posterior sac on the same side, a slit is shown which extends anterior and dorsal to the hepatic veins. Here it communicates by means of a round opening, about 1 cm. in diameter, with a large cavity lying on the median and dorsal side of the proventriculus and extending to the spleen. The cavity does not extend on the dorsal side of the gizzard. In all respects it corresponds with the right gastric diverticulum of embryos and with the lesser peritoneal cavity of mammals.

The relation of the embryonic omentum with the "pseudo-epiploön" is as yet unknown. However, I

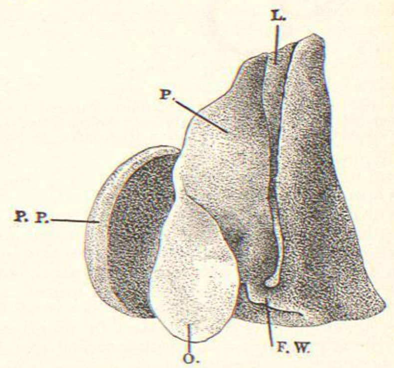

FIG. 1409.—Corrosion Preparation of the Right Gastric Diverticulum from a Chick of One Hundred and Thirty-six Hours. (× 15 times.) *P.P.*, Pleuro-peritoneal cavity; *F.W.*, foramen of Winslow; *L.*, position of right lung; *P.*, position of proventriculus; *O.*, omental cavity (position of gizzard).

think it probable that the one is changed into the other, and that the "pseudo-epiploön" will prove to be the true epiploön homologous with the same in mammals. We

must imagine only the embryonic omentum attaching itself on the sides of the abdomen followed by a loss of the epiploönic cavity. A subsequent growth of the air sacs backward from the dorsal side of the stomach will produce the condition found in the adult.

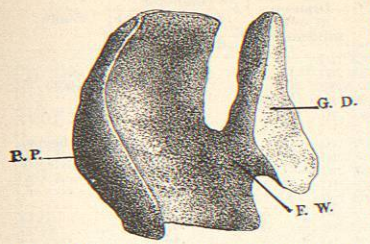

FIG. 1410.—Corrosion Preparation of the Gastric Diverticulum of a Human Embryo, 7 mm. long. (× 35 times.) *P.P.*, Pleuro-peritoneal cavity; *F.W.*, foramen of Winslow; *G.D.*, gastric diverticulum.

In mammalian embryos, while the stomach is still upright, only one gastric diverticulum is found. It is on the right side in Figs. 1399 to 1401, which are taken from a young human embryo. In each drawing the cœlomic cavity is colored black and the position of the section can be made out by the organs which are cut across in the section. A cast of the cavity is shown in Fig. 1405. The portion of the cavity on the right side of the stomach and the liver is shown in Fig. 1410, which is taken from a cast also. Figs. 1399, 1400, and 1401 show sections through the gastric diverticulum of Fig. 1410, Fig. 1401 being through the foramen of Winslow.

The general form of the cavities is shown in Fig. 1410, which is taken from a resconstruction of a human embryo. The peritoneal cavity surrounds the Wolffian body, intestine, omphalo-mesenteric vessels, stomach, liver, and lungs, with the addition of the right gastric diverticulum.

In lower mammals, according to Ravn, there are two diverticula; so the symmetrical arrangement of these cavities in reptiles, is still indicated in the mammals. It is so insignificant, however, that we need not take it into consideration.

The fate of the right gastric diverticulum of mammals has been studied in the dog, and it has been found that it is converted directly into the lesser peritoneal cavity, much as is shown in Figs. 1396 and 1397. In a dog's embryo, 6 mm. long, the diverticulum is much like what it is in the human embryo of about the same size (Fig. 1410). A dog embryo, 10 mm. long, shows a picture more advanced, much like what is seen in the chick of five days (Fig. 1409). In a later stage (Fig. 1411) the stomach has been twisted about, holding in great part the adult

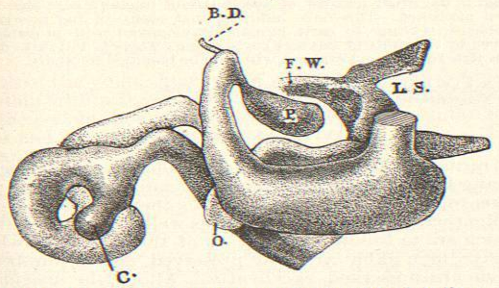

FIG. 1411.—Corrosion Preparation of the Stomach, Intestines, and Lesser Peritoneal Cavity of a Dog, 13.5 mm. Long, Viewed from the Left Side. (× 15 times.) The lesser peritoneal cavity has been filled with metal. *B.D.*, Bile duct; *P.*, *pancreas*; *C.*, cæcum; *O.*, omentum; *F.W.*, foramen of Winslow; *L.S.*, position of lobus Spigelii.

position. The liver, which before lay on the ventral side of the stomach, now lies in front, and to a great extent on the dorsal side of it. A model of these parts from a 10-mm. embryo, simply rotated to throw the stomach away from the mouth, gives the condition of things as they exist in the embryo 13 mm. long.

Fig. 1411 shows the lesser peritoneal cavity as a cast stuck in behind the stomach. The intestine is composed of two loops, one from the stomach, extending into the pelvis, and the other from the cæcum into the umbilical cord. The rapid growth of the large intestine has thrown the cæcum as high as the stomach and to the right of it. The fold of mesogastrium coming from the dorsal side of the stomach passes over the large intestine to form the omentum (Fig. 1411, *O.*). The general shape of the lesser

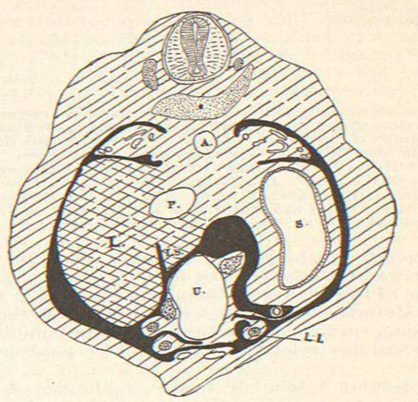

FIG. 1412.—Section through the Foramen of Winslow and Lobus Spigelii of a Dog, 13.5 mm. long. (× 36 times.) *A.*, Aorta; *S.*, stomach; *P.*, portal vein; *U.*, umbilical vein; *L.S.*, lobus Spigelii; *O.*, omental cavity; *L.I.*, large intestine.

peritoneal cavity is shown in transverse section in Fig. 1412, which can be compared with Fig. 1401. The S-shaped loop of intestine is cut across three times, and the lesser peritoneal cavity with the foramen of Winslow is shown throughout its whole extent.

The omentum from now on rapidly grows over the whole ventral wall of the abdominal cavity, and in man adheres to the colon as first described by Meckel.

A résumé of the comparative development of the cœlom of the embryo is given in Figs. 1394 to 1397.

Franklin P. Mall.

CŒLOM, HUMAN, DEVELOPMENT OF THE.—Unfortunately, there are no data regarding the beginning of the cœlom in the human embryo, and in all probability none will ever be found. The smallest human described until recently is that described by Reichert.[1] It was obtained from a woman who had committed suicide, on account of pregnancy, forty-one days after the beginning of the last menstrual period. It was therefore presumably about thirteen days old. This ovum, which is pictured in every text-book, was 5.5×3.3 mm. in diameter, was surrounded by a zone of villi leaving two poles bare, and contained in its interior a mass of cells measuring 1.5×1.75 mm. All the space between this inner mass and the chorion is the cœlom, and regarding its origin we can no more than speculate.

During the last few years five other human ova, about as large as Reichert's, have been cut into sections, thus permitting a more careful study of their contents.[2] The dimensions and approximate ages of these embryos are given in the table in the first column of the following page.

It is noticeable that in the embryos just mentioned the size of the whole egg does not correspond with the size of the embryo, nor with its age. I do not think that this great variation in the size of the chorionic vesicle is altogether due to the method of hardening the specimen. Just at this time the growth of the chorion is precocious, as is also the case in the dog,[3] rabbit,[4] and monkey.[5]

The papers by Bischoff and by Selenka are worthy of the most careful study by every embryologist, and I take the liberty of rearranging some of Bischoff's data on the