ing fifty passengers plies between the two points. The location is seven hundred and fifty feet above the sea level. The country surrounding the springs is broken by ranges of elevations called "bluffs," between which are beautiful and productive valleys from one to three miles wide. The main valleys are intersected by smaller depressions at intervals of about a mile. All of these valleys contain clear trout streams coursing down their centres. This peculiar conformation gives the country an aspect of picturesque beauty not soon forgotten when once seen. The fine scenery and salubrious climate are beginning to attract visitors to this region in rapidly increasing numbers. A large hotel is badly needed. The springs flow from beneath a precipitous bluff out of the rocks, filling a pipe six inches in diameter. The water as it flows has a temperature of 48° F. The following analysis was made by Prof. W. W. Daniels, of the State University:

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Potassium sulphate	0.19
Sodium sulphate	0.07
Sodium chloride	0.76
Calcium chloride	0.05
Calcium bicarbonate	13.65
Magnesium bicarbonate	9.84
Iron bicarbonate	0.26
Alumina	0.15
Silica	0.06
Total	25.03

The water is a mild alkaline-calcic, with light chalybeate properties. It is useful in acid dyspepsia, chronic constipation, renal congestion, the early stages of Bright's disease, and in general debility.

Galesville is a thrifty village of more than one thousand inhabitants, and numbers among its attractions telegraph and telephone facilities, electric lights, water-works, a fine water-power, etc. *J. K. Crook.*

ARCUS SENILIS.—Gerontoxon (from Greek, γέρων, old man, and τόξον, bow, arch); *Macula arcuata* or *macula corneæ; Marasmus senilis corneæ; Annulus senilis;* German, *Greisenbogen;* French, *Arc Sénile.*

Arcus senilis occupies the peripheral portion of the cornea as a light gray arc. The opacity, smooth on the surface, is more pronounced toward the limbus, being sharply defined from it by a narrow, transparent strip, while the concavity of the arc emerges gradually into the transparent cornea. The opaque arc always appears first above, and gradually advances downward. It always remains broadest above and is at the same time more opaque in this part. Finally, the two arcs unite at the outer and inner side of the cornea to form a closed ring.

The opacity is at first of a light gray color, appearing like a silver band. At a later period, the opacity assumes a denser and more creamy tint, increasing at the same time in depth and width. Arcus senilis, as the name indicates, is an affection of advancing years, and rarely occurs under fifty years of age except in those infrequent cases in which it seems to occur as an inherited characteristic. Thus, for example, I know of a family in which three male members have all had the completed arc as early as at the age of thirty-five, and in none of them is there any apparent cachexia.

The condition is usually bilateral, although one eye alone may be affected. It occurs more frequently and at an earlier date in men than in women. In warm climates it is developed earlier than in cold latitudes, and it is frequently seen in negroes on the north coast of Africa.

A condition resembling very much arcus senilis is found in the young, but is not to be confounded with it. It has been called by Wilde *arcus juvenilis,* and may be distinguished from the former by the presence of a diaphanous ring between the margin of the cornea and the opacity.

Arcus senilis never interferes with vision, although it may extend somewhat into the corneal substance.

PATHOLOGY.—Arcus senilis is due to an infiltration of a finely granular hyaline substance. It is commonly stated, even in the more recent text-books, that it is due to a fatty degeneration or infiltration of the cornea; but this has been shown by Fuchs not to be the case, for he says it is a typical example of physiological, non-inflammatory opacity. He found that the infiltrated material never has any relation to the cells of the corneal tissue, but lies free upon the surface of the connective-tissue fibres. Neither ether nor chloroform has any effect upon it; consequently it cannot be of a fatty character. Fuchs considers it to be a hyaline degeneration of certain fibres.

This deposition of hyaline masses is also associated with deposits of minute particles of lime on the more superficial layers of the cornea, close to the limbus, and the cause is assumed to be a senile atrophy of the limbus, with involution of a portion of the vascular loops contained therein. Gruber attributes the appearance of these changes in this particular portion of the cornea to the peculiarities of the circulation in the cornea; the peripheral zone being nourished mainly by transudation of nutritive materials from the circumcorneal plexus. At the same time the changes in question are favored by the fact that, with advancing age, the circulation grows less active and consequently the nutrition progresses more feebly.

Arcus senilis would, therefore, appear to be a normal phenomenon, that occurs in perfectly healthy people, is due to the decrease of nutrition incident to advancing years, and has no relation to fatty degeneration of the heart, as was formerly supposed.

There are no symptoms. The slight disfigurement and the apprehension of future trouble which many, not knowing its character, anticipate, constitute the only sources of annoyance. So far as the patient's fears are concerned, these may easily be allayed; for the condition never interferes with vision. Incisions through the arcus senilis, as in the extraction of cararact, heal as well as those made through the clear parts of the cornea.

William Oliver Moore.

AREA EMBRYONALIS.—Eggs may be divided into two general classes: holoblastic, which have a complete segmentation; and meroblastic, in which only a portion of the egg becomes divided into cells during the process of cleavage. In the first class the eggs contain little or no yolk, like the egg of a starfish. In the second class, on the other hand, there is a great deal of yolk, as in the hen's egg (see article *Segmentation of the Ovum*).

It is the second class of eggs, as a rule, in which the distinction can be drawn between the strictly embryonic portion, or *area embryonalis,* and the strictly extra-embryonic portion, or yolk sac. The area embryonalis is spoken of also as the *area germinativa, germinal disc,* or *blastoderm.* While as a rule holoblastic eggs do not show a differentiation into these two areas, it is a remarkable fact that the mammalia present a minute egg which undergoes complete segmentation and yet in its subsequent development follows the type of the meroblastic eggs.

The area embryonalis of the hen's egg may be taken as presenting the typical structures. This has been the subject of investigation by a number of authors, the most complete and satisfactory description being that given by Mathias Duval.

At the close of segmentation the area embryonalis, or blastoderm, consists of a lenticular mass of cells, about 2 mm. in diameter, lying in a hollow over the plug of white yolk. The rest of the egg is unsegmented, but in the yolk close to the periphery of the blastoderm are a number of nuclei that may be called the yolk nuclei, or *periblastic* nuclei. The blastoderm consists of two layers: an outer single layer of columnar cells, the ectoderm, and an inner mass of rounded cells, the primitive entoderm. As the blastoderm increases in size the entodermal cells in the centre become more loosely arranged, forming finally a layer one cell deep, which is separated from the yolk by

a *subgerminal cavity* filled with fluid. At the margin, on the other hand, the entoderm forms a thick rim, and at the extreme edge it is impossible to draw an exact boundary line between the entoderm and the ectoderm. At this stage the marginal rim is somewhat broader and

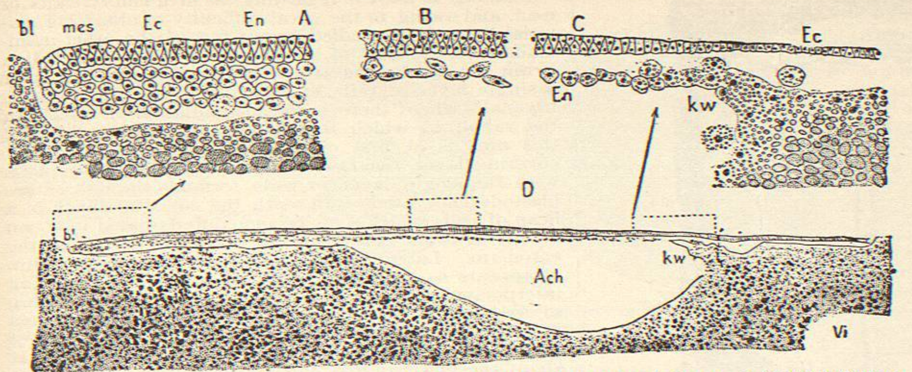


FIG. 261.—Median Longitudinal Section Through Hen's Blastoderm Incubated six hours. D, × about 40 diameters; A, B, C, details of D more highly magnified; *Ach*, subgerminal cavity; *Ec*, ectoderm; *En*, entoderm; *kw*, germinal wall; *mes*, marginal rim. (After Duval, from Minot.)

thicker at the posterior margin than it is at the anterior. Later, the ectoderm becomes separated from the entoderm at the margin and grows over the surface of the yolk. This process, by which the rim gradually disappears, begins at the anterior edge. Between the fifth and eighth hours of incubation it has reached the sides of the blastoderm, and it finally extends around the whole periphery. At the same time the entoderm becomes connected with the yolk at the edge of the subgerminal cavity, which meanwhile has become deeply excavated and bounded at the margin by a perpendicular wall (Fig. 261). Further growth of the entoderm takes place by the addition of cells from the periblast. The periblastic nuclei divide, and those nearest the margin become surrounded by a cell body of finely granular protoplasm, and the cells thus formed by cleavage of the yolk are added to the margin of the entoderm.

It is now possible to divide the area embryonalis into two regions. The central transparent portion overlying the subgerminal cavity is called the *area pellucida,* while the peripheral portion in direct contact with the yolk is the *area opaca.*

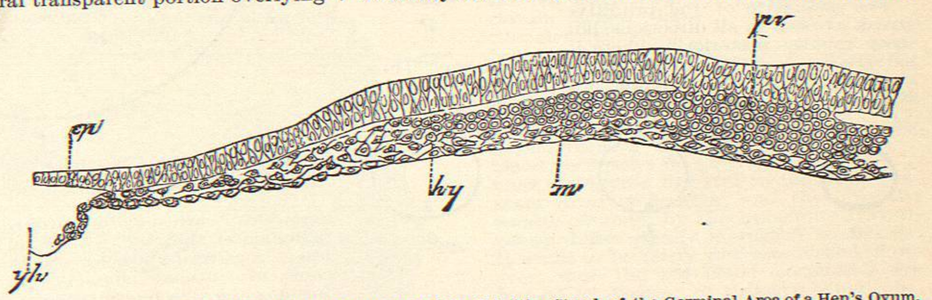


FIG. 262.—Transverse Section through the Front End of the Primitive Streak of the Germinal Area of a Hen's Ovum, incubated about eighteen to twenty hours. (After Foster and Balfour.) *pv*, Primitive streak; *ep*, ectoderm; *hy*, entoderm; *m*, mesoderm; *gh*, germinal wall.

While the marginal rim is disappearing from the anterior edge of the blastoderm, a new structure is making its appearance on the median line extending from the posterior edge toward the centre of the area pellucida. This is the *primitive streak.* In a surface view it appears as an opaque area, and in sections it is found that the ectoderm and entoderm have the same relations to one another that they do in the marginal rim. That is, there is an accumulation of the primitive entoderm which cannot be separated from the ectoderm by any sharp line of demarcation (Fig. 262, *pv*). The primitive streak elongates with the general enlargement of the blastoderm until the marginal rim is reduced to a mere point of connection between the primitive streak and the edge of the blastoderm—about the twelfth hour of incubation. Finally, the ectoderm separates from the entoderm at this point also and grows out over the yolk. In this way the primitive streak acquires the position shown in Fig. 263.

From his observations Duval concludes that the primitive streak is formed by the concrescence of the marginal rim, as if the enlargement of the blastoderm were arrested at one point and the margin at the two sides of this point were brought together. This is best illustrated by Duval's diagram, Fig. 264.

The growth of the blastoderm of the chick has been studied experimentally by Assheton, Miss Peebles, and Kopsch, but Assheton's experiments are the only ones that bear directly upon Duval's theory. The experiments were made by inserting a fine sable hair in the unincubated blastoderm, after which the egg was placed in the incubator and the position of the hair was noted in the subsequent stages of development. It was assumed that, according to Duval's theory, a hair placed in the posterior median portion of the marginal rim should appear, when the primitive streak is formed, somewhere in front of the primitive streak (Fig. 265, (*i*), *a*), and hairs inserted in the posterior margin at X X should appear in the primitive streak or prevent its formation. On the contrary, it was found that hairs inserted at *a* and X X appeared behind the primitive streak in the area opaca (Fig. 264, *ii*), while a hair inserted at the centre of the unincubated blastoderm appeared at the anterior end of the primitive streak. From these experiments it may be concluded that the primitive streak of the chick does not form by concrescence, but that its anterior end is formed *in situ* by the multiplication of cells in that area, and its further increase in length is probably due to an area of proliferation at its posterior end. These results are in accord with the observations of Morgan on bony fishes and of H. Virchow and Kopsch on sharks. In the blastoderm of Scyllium there is a distinct notch in the line of the primitive streak, and Kopsch found that a wound at the edge of this notch would interfere with the formation of the embryo; but a wound of the marginal rim a short distance from the notch caused only a distortion of the extra-embryonic part of the blastoderm and a curving of the embryo.

During the latter half of the first day of incubation of the hen's egg the definitive entoderm is formed by the

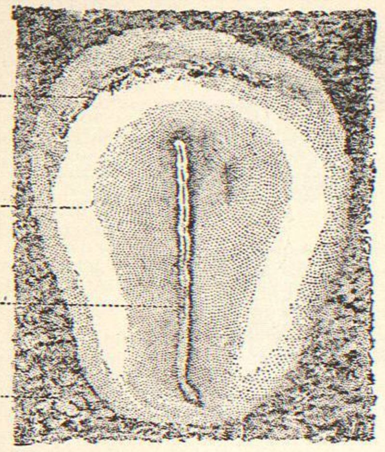
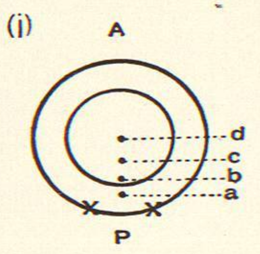


FIG. 263.—Area Pellucida of the Hen's Egg Incubated about 16 hours. *a.o.*, Area opaca; *ct*, anterior crescent; *a.p.*, area pellucida; *pt*, primitive groove beneath which is the primitive streak. × 20. (After Duval, from Minot.)

arrangement of the cells on the lower side of the blastoderm in a continuous single layer of flattened cells. In the region of the primitive streak there is left a mass of cells continuous with the ectoderm above but separated from the entoderm below. These cells form an important part of the mesoderm. According to Duval they are the remains of the primitive entoderm, but according to Marshall they are of ectodermal origin. In the anterior and lateral parts of the area pellucida other mesodermal cells are formed by proliferation of the entoderm.

The mesoderm of the primitive streak extends in all directions, but most rapidly posteriorly where it extends out over the yolk beyond the entoderm. Three stages in the extension of the mesoderm are shown in Fig. 266, where the area covered by the mesoderm is represented by the vertical shading. By this time the area pellucida has changed from its original circular form to a pear-shaped outline, and the extra-embryonic ectoderm has spread far out over the yolk, which it will ultimately inclose.



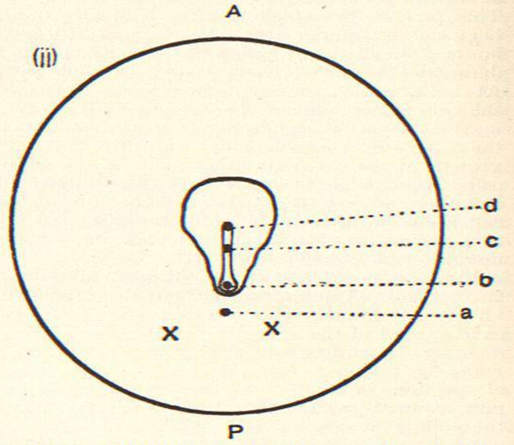


FIG. 265.—Diagrams to Illustrate Assheton's Experiments. (*i*), Unincubated blastoderm of a bird; (*ii*), blastoderm after the complete formation of the primitive streak. (After Assheton.)

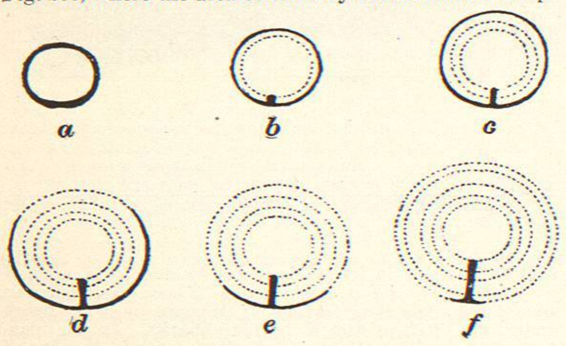


FIG. 264.—Diagrams to Illustrate Duval's Theory of the Formation of the Primitive Streak by the Concrescence of the Marginal Rim. *a*, Marginal rim complete; *b*, first appearance of primitive streak at posterior margin, the dotted circle indicates the relative position of the rim in *a*; *c*, *d*, *e*, succeeding stages; *f*, remnant of rim at posterior end of nearly completed primitive streak. (After Duval.)

Nothing is known regarding the area embryonalis of man, and owing to the great difficulty of obtaining material it has been studied in but few of the other mammalia. At the close of segmentation of the mammalian ovum the blastoderm is a closed vesicle consisting of a single layer of cells, except in the disc-like area embryonalis where there is an accumulation of cells. In the rabbit, in which the early stages are best known, this area is at first circular. It consists of an outer covering layer, the Deckschicht of Rauber, continuous with the single layer of cells forming the rest of the blastodermic vesicle. Beneath the covering layer is a heap of cells which soon become differentiated into two layers, each one cell thick, the inner ectoderm and the entoderm. Later, the covering layer, or outer ectoderm, disappears as a separate structure by its cells becoming interpolated with those of the inner layer. According to Assheton this circular area forms the primary area of growth of the young embryo. A secondary area of growth appears on the periphery of the primary area at about the one hundred and sixtieth hour after coitus. In this secondary area the primitive streak is formed, from which wings of mesoderm grow out as in the chick. By the end of the eleventh day the area embryonalis of the rabbit has assumed the form represented in Fig. 267.

The embryo is seen lying in the centre of the area and surrounded by a more transparent portion, the area amniotica, corresponding approximately to the area pellucida of the chick. Beyond this is the area vasculosa. A part of the ectoderm in this region has already come into intimate contact with the wall of the uterus, forming the area placentalis.

In some rodents, for example the rat, the area embryonalis is formed as a solid plug of cells which grows inward and subsequently acquires a lumen, so that what is morphologically the external surface of the ectoderm becomes the wall of a closed sac. In such cases we have a condition that has been described as an inversion of the germ layers, the entoderm appearing to lie outside of the ectoderm (Fig. 268).

Certain features of the earliest known human embryo have given rise to the supposition that there may be a similar inversion of the germ layers in man.

The origin of the area embryonalis is described under *Segmentation of the Ovum*, and the formation of the em-

bryo is treated in the article on the *Fœtus*. It remains for the present article to discuss only the later changes in the extra-embryonic area.

The most important function of the extra-embryonic area is the formation of blood-vessels and the blood.

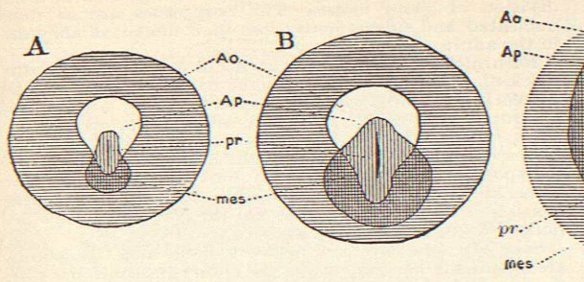


FIG. 266.—Diagrams of the Area Embryonalis of the Chick, Showing Growth of the Mesoderm. *Ao*, Area opaca; *Ap*, area pellucida; *mes*, mesoderm; *pr*, primitive streak. (After Duval, from Minot.)

This begins in the chick in that part of the area opaca where the wings of mesoderm spread over the yolk forming the area vasculosa, and in the rabbit it occurs in the homologous area. From this the vessels extend later through the area pellucida into the embryo.

According to Srahl, in the lizard, on the contrary, the blood and the blood-vessels appear first in the area pellucida.

Toward its edge the area vasculosa is so thick that it appears as though the whole mesoderm took part in the formation of the blood-vessels. But wherever the splitting of the mesoderm into the two layers, somatopleure and splanchnopleure, has taken place it is seen that the blood-vessels form in the inner layer, next to the entoderm, that is, in the splanchnopleure. The formation of blood corpuscles and the development of the vessels are intimately connected. Schäfer's account of the process is as follows:

"Those mesoblastic cells in the vascular area which are concerned with the formation of vessels (*angioblasts*) become extended into processes of varying length, which grow out from the cells in two or more directions. The cells become united with one another, either directly or by the junction of their processes, so that an irregular network of protoplasmic nucleated corpuscles is thus formed. Meanwhile the nuclei become multiplied, and whilst the greater number remain grouped together in the original cell bodies, or nodes of the network, some are seen in the uniting cords. The nuclei which remain in the nodes accumulate, each one around itself, a small amount of cell protoplasm. The corpuscles thus formed acquire a reddish color, and the protoplasmic network in which they lie becomes vacuolated and hollowed out into a system of branched canals enclosing a fluid, in which the nucleated colored corpuscles float (blood islands). The intercommunicating canals gradually become enlarged so as to admit of the passage of the corpuscles. The protoplasm which forms the walls of these first vessels becomes differentiated around the nuclei, which here remain embedded in it, so as to give rise to the flat cells which compose the blood capillaries."

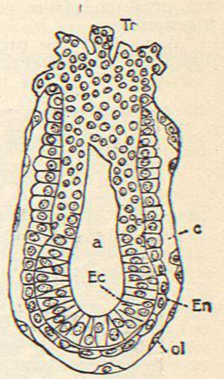


FIG. 268.—Blastodermic Vesicle of a Mouse, Mus Sylvaticus. *a*, Cavity of "Träger"; *Ec*, ectoderm; *En*, entoderm; *c*, cavity of vesicle; *ol*, outer layer; *Tr*, "Träger." (After Selenka, from Minot.)

These first-formed blood corpuscles are nucleated in all vertebrates, and the corpuscles remain nucleated throughout life in all except the mammals. In later embryonic life red blood corpuscles are formed in the subcutaneous tissue, in the liver, the spleen, lymph glands, and in the marrow of bones. In the adult under normal conditions new red blood corpuscles are formed only in the red marrow of certain bones, the ribs, sternum, short bones of the extremities, and epiphyses of the long bones.

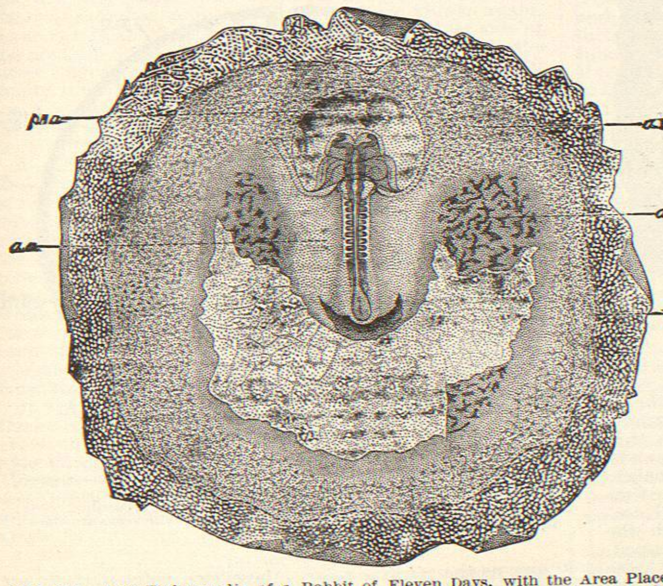


FIG. 267.—Area Embryonalis of a Rabbit of Eleven Days, with the Area Placentalis partly torn off. (After Van Beneden and Julin.) *pr.a.*, Pro-amnion; *a.a.*, area amniotica; *a.v.*, area vasculosa; *a.pl.*, area placentalis.

The study of the development of the blood corpuscles in later embryonic life and in the adult presents many difficulties, and therefore the results obtained by the numerous investigators differ greatly in regard to details. It seems to be fairly well established, however, that the red blood corpuscles are formed by division of primary blood cells, erythroblasts, which have nuclei that divide by mitosis, and in which the cytoplasm contains hæmoglobin. Whether the erythroblasts arise within the capillaries or outside of them, and whether the erythroblasts have an origin in common with the primary white blood corpuscles, leucoblasts, or are cells of a peculiar kind, are questions that have been answered so differently by different investigators that no general rule can be stated. The red blood corpuscles of the mammals, at any rate, are at first nucleated cells. According to some accounts the nuclei are extruded from the corpuscle, according to others they undergo degeneration *in situ* and thus disappear.

Schäfer has described as occurring in the newly born rat a peculiar method of origin of red blood corpuscles.

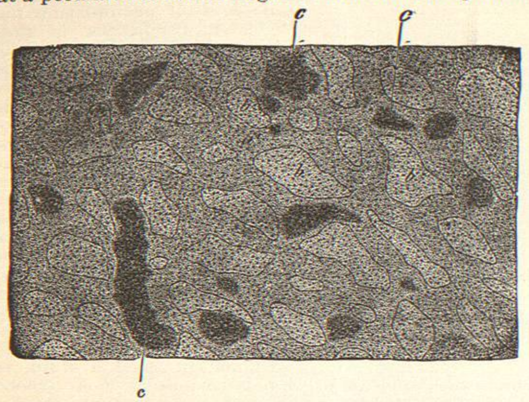


FIG. 269.—Vessels of the Area Pellucida of a Chick of Two Days. *a, a,* Vessels; *b, b,* interstitial tissue; *c, c,* blood islands. (After Kölliker.)

He found in the subcutaneous tissue blood islands, which are produced from connective-tissue cells in the following manner:

"A part of the protoplasm of the cell acquires a reddish tinge, and after a time the colored substance becomes

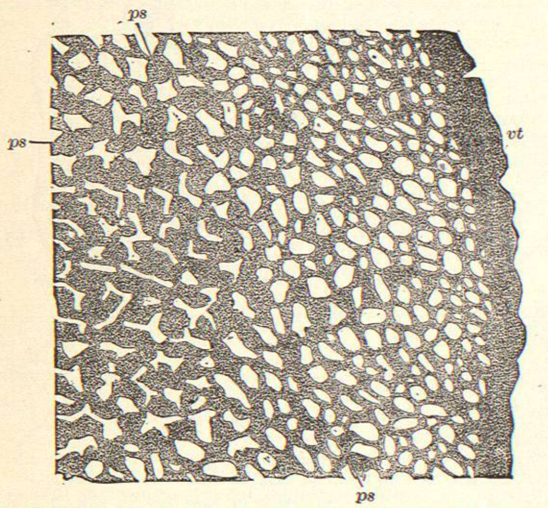


FIG. 270.—Part of Area Vasculosa of Embryo Chick of Forty Hours. × 26 diameters. (After Kölliker.) Only the vascular network is drawn, *ps,* and the terminal sinus or vein, *vt.*

condensed in the form of globules within the cells, varying in size from a minute speck to a spheroid of the diameter of a blood corpuscle, or even larger; but gradually the size becomes more uniform. . . . After a time the cells become elongated and pointed at their ends, and processes grow out to join prolongations of neighboring blood-vessels or of similar cells. At the same time vacuoles form within them, and becoming enlarged coalesce to form a cavity filled with fluid, in which the reddish globules, which are now becoming disc-shaped, float." Corpuscles formed thus by a process akin to secretion cannot be regarded as homologous with the corpuscles that are formed by the metamorphosis of nucleated cells in the early stages of the embryo and in the adult. This process of intracellular blood formation does not receive confirmation, however, from the studies of Saxer, who found similar blood islands in the subcutaneous tissue of the newly born sheep. According to his account, these islands arise by the repeated mitotic division of giant cells. The corpuscles are at first nucleated and subsequently lose their nuclei as they do in the adult.

Returning now to the area vasculosa, we find in the chick of the second day that the vessels form a coarse network (Fig. 270), without any indication of large stems or trunks, except the broad limiting sinus, *vt,* which marks off the edge of the area. There is only one layer of vessels. Scattered about in the network are irregular red spots, which received from early embryologists the name, still current, of blood islands. At first the network consists of solid cords of cells, but the cords soon become hollowed out as described above.

Soon after the capillary network of the area opaca and area pellucida has penetrated the embryo, certain lines of the network begin to widen, and soon distinctly assume the size and functions of main trunks; some of these unite with the posterior venous end of the heart, which has meanwhile been formed in the embryo, and others become connected with the anterior or aortic end; even before this the heart has begun to beat, so that as soon as all the connections are made, the primitive circulation starts up. The arrangement of the vessels is not the same in birds and mammals, although commonly so stated. The disposition in birds is indicated by the diagram shown in Fig. 271, in which, it should be remembered, the embryo and the capillary network are drawn many times too large in proportion to the *area vasculosa.* The area is bounded by a broad circular vessel, the sinus terminalis, S.T., which constitutes a portion of the venous system in birds, for in front of the head of the embryo the sinus leaves a gap and is reflected back along the sides of the body of the embryo, to make two large veins, which, after uniting with other venous channels coming from various parts of the area vasculosa on each side, enter the embryo as two large trunks, Om.V.,

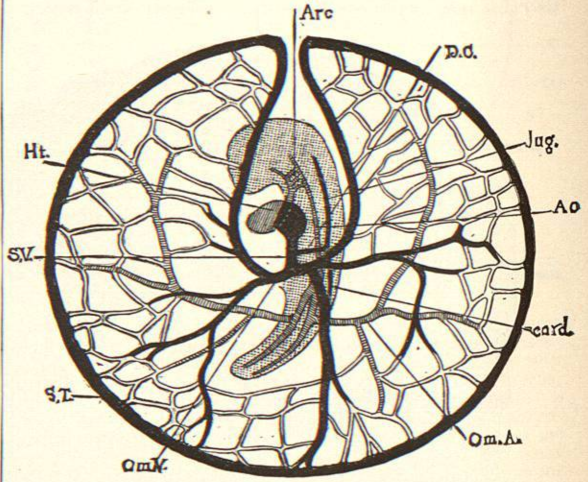


FIG. 271.—Diagram of the Circulation in a Chick at the End of the Third Day, as seen from the Under or Ventral Side. The embryo, with the exception of the heart, *Ht.*, is dotted; *Arc.*, aortic arches; *D.C.*, ductus Cuvieri; *Jug.*, jugular vein; *card.*, cardinal vein; the remaining letters are explained in the text. The veins are black; the arteries cross-lined. (From Minot.)

known as the *vitelline veins;* these two veins unite in a median vessel, the *sinus venosus,* S.V., which runs straight forward and enters the posterior end of the heart. The

sinus venosus also receives the veins from the body of the embryo, namely, the jugulars, *jug.*, and cardinals, *card.;* the former from in front unite each with the cardinal of the same side, making a short transverse trunk, known as the *Ductus Cuvieri,* D.C.; the two ducts

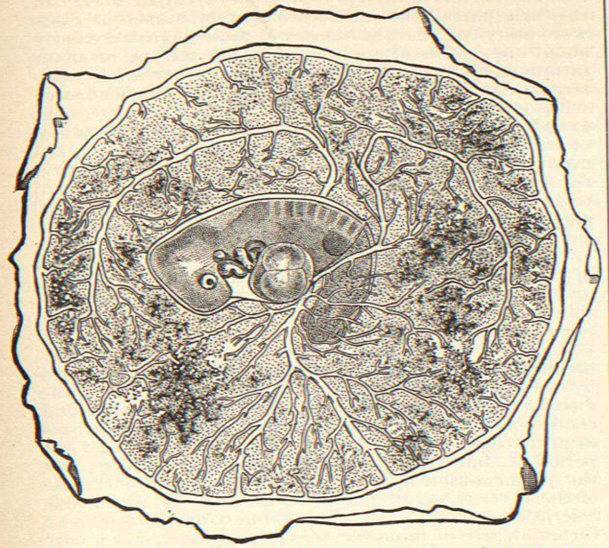


FIG. 272.—Area Vasculosa and Embryo of a Rabbit. (After Van Beneden and Julin.)

empty into the sinus venosus. The entire venous current is thus brought to the heart in a united stream; it passes out through the aorta; the greater part ascends the aortic arches and passes back as shown in the figure, Ao., and divides at the posterior fork of the aorta, the bulk of the two currents passing out through the vitelline arteries, Om.A., and thence into the capillaries of the *area vasculosa,* and so on to the venous trunks again. As shown in the figure, which presents the under side of the area, the left vitelline vein preponderates, and, in the latter stages this difference becomes more marked, until finally the right stem is very inconsiderable in comparison with the great left vein. The time at which the disparity commences is extremely variable, as is also the degree of inequality between the two veins.

According to Van Beneden's researches on the rabbit the arrangement of the main vessels in the area vasculosa of mammals is quite different (Fig. 272). The sinus terminalis forms a *complete* ring and is connected with the *arterial* system by a single trunk, which corresponds to the left vitelline artery of the bird. For some time the connection between the embryonic arteries and the area vasculosa is entirely through capillaries, and the arterial trunk on the vascular area does not appear in the rabbit for several days. There are two veins, one arising from each side of the body and passing out on to the area vasculosa over the back of the embryo; they are the two large upper vessels in the figure.

In the mammalian ovum we have further to distinguish the *area placentalis,* that portion of the chorion by which the embryo is attached to the uterine wall, and which afterward participates in the formation of the placenta. Whether this exists in all mammalia distinctly marked out during very early stages is uncertain, but in some species, at least, it is present at an extremely young stage. *Robert Payne Bigelow.*

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ARECA.—(*Areca Nut. Betel Nut.*) The areca palm, *Areca Catechu* L., is a fine large tree, with smooth, graceful stem and a handsome crown of long pinnate leaves. The flowers are monœcious; the fruit is egg-shaped, with a fibrous mesocarp and a hard stone consisting of the seed and adhering endocarp. It is from 50 to 75 cm. (2 to 3 inches) long. The albumen is hard, ruminated, and contains a minute embryo near the base. This tree is a native of India, the Sunda Islands, and probably of other neighboring parts. It is cultivated there and elsewhere in the tropics for the sake of its seeds, which have been an article of Asiatic commerce for centuries. There is still an enormous consumption of them in China and India, chiefly as a masticatory; for this purpose they are boiled, or used when fresh and soft. They are often chewed with the leaves of the betel pepper and lime. Their introduction into European medicine is rather recent.

Areca nuts of our market consist of the kernel of the seed only, the testa being removed with the pericarp. They are about 2 cm. in diameter, and about as long as broad. Their shape is between spherical and conical, with a very blunt rounded point, and a broad, flat, or sometimes depressed base. The surface is of a cinnamon-brown or grayish color, and covered with a network of vein-like lines, which radiate irregularly and spirally from the base toward the apex. The albumen is very hard and bone-like, and upon being sawed through presents a marbled surface like that of the nutmeg, caused in the same way, that is, by the infolding of the brown surface layer of the seed (endosperm), which takes place under the reticulated lines above described. The general color of the section is whitish, the lines are brown.

The important constituent of areca is its alkaloid, arecoline, which is oily, volatile, miscible with water or alcohol, strongly alkaline, very poisonous and yields crystalline salts. Its other three alkaloids, arecaine, arecaidine, and guvacine, are not poisonous, and appar-