PLATE V.

EXPULSION OF THE EGG FROM THE GRAAFIAN VESICLE, AND FORMATION OF THE CORPUS LUTEUM.

In Figure 1 the ovum, about the size of a pin's head, is seen at the bottom of the Graafian vesicle, which is filled with the white fluid.

In Figure 2 a little blood has formed underneath it, raising it up.

Figures 3, 4, 5, 6, 7, the blood is seen to increase, raising the egg still higher, and displacing the white fluid.

In Figure 8 the whole vesicle is filled with blood, and the egg is forced up against the membrane at the top.

In Figure 9 the vesicle is shown full size, and burst open, the egg just escaping through the opening, as fully explained farther back.

Figure 10 shows the cell after the egg has been expelled, full of dark blood.

Figures 11 and 12 show the blood beginning to be absorbed.

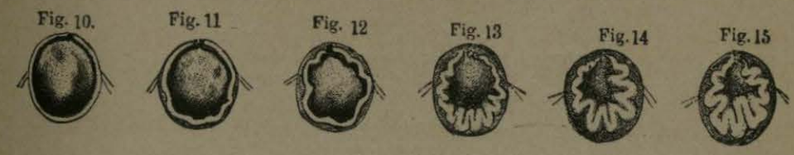
In Figures 13, 14, 15, 16, the blood is still less, and the inner membrane is corrugating, so as to fill up.

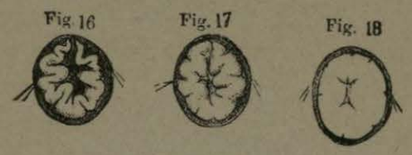
In Figure 17 the blood is nearly all gone, and the corrugated inner membrane has taken its place.

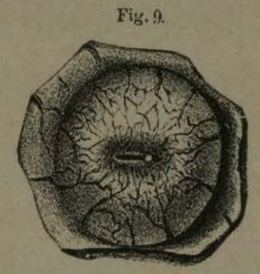
In Figure 18 the old membrane fills the cavity, and is become yellow, forming a true Corpus Luteum, or yellow scar.

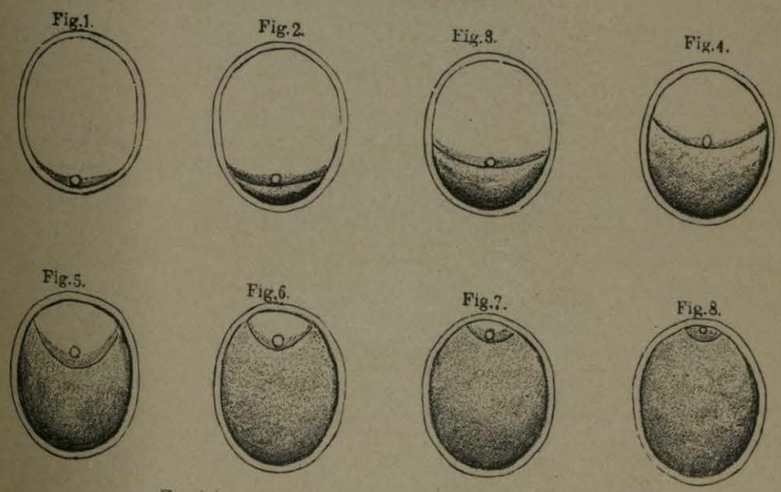
This Plate shows very clearly how the egg is expelled, and how the Corpus Luteum takes the place of the Graafian vesicle. This is what occurs in the human female each month.

PLATE V.









Expulsion of Ovum, and Formation of the Corpus Luteum.

nothing else succeeds so well in doing so, which is the reason why marriage is often recommended for young females who are irregular or deficient. On the other hand there are others whose ardor it is necessary to moderate, because their over-indulgence excites the ovaries too much, and they form the ova too frequently. I have often found that producing the sexual feeling in females who had their periods too seldom, and who were cold in their temperaments, led immediately to a more frequent and regular menstruation, although *medical* treatment had utterly failed in doing so. In like manner I have known conception to result from the same change, after every other means had been resorted to in vain. Blumenbach gives us a singular confirmation of this principle, for he tells us that he has seen some kinds of birds practice a species of masturbation, or excite themselves with their bills, and that immediately afterward they always laid an egg, even though there was only a half-formed one in the body to be expelled.

The condition in which animals live has a great influence over the action of the ovaries, so as to completely change it in many respects. Thus, for instance, the wild turkey lays but one lot of eggs in a year, and probably most other species of fowls do the same in a state of nature, but when domesticated, regularly and well fed, and sheltered, they will lay many more; sometimes even they will continue to do so almost constantly. This is owing to the influence of rich and plentiful food, with the absence of privation and exposure, which allows more nutriment, and more vital power to be expended upon the ovaries. It is probable that all cattle, when wild, have their *œstrum*, or heat, at some particular season of the year, but whenever they are domesticated, it occurs in them irregularly and usually more frequently.

Among human beings, however, the manners and customs of society have more influence, perhaps, than any other causes, because the sexual instinct in them can be awakened and exalted through the medium of the imagination, and because the action of the ovaries is so frequent as to keep the whole system more or less constantly under their influence. In the human being *Love* is a compound feeling, embracing a variety of propensities and desires, domestic and social, besides the *animal* propensity, so that it is awakened in very many different ways, while in the animal it is called forth only by one impulse. In the article on Menstruation the effects of social conditions are made apparent; and the early amative manifestations of young persons, in all places, when their intercourse is unrestricted, also affords abundant proof of the same.

Too high feeding often impairs the generative power, by unnaturally stimulating the formation of *fat*, owing to which the functions of the ovaries, in common with those of many other organs, are then in a great measure suspended, because all vital power is concentrated on the one absorbing process of Nutrition. On the other hand, a meager and poor diet is also apt to impair the vigor of the sexual organs, or if it does not do so, the other organs suffer, because there is not nutrition enough to maintain them *all* in full action. In the human being, however, as already remarked, there are so many other causes operating upon the sexual system, that the physical condition is not of such paramount importance as it is in the lower animals. Thus we often see whole classes of people, who live in the most wretched manner, and are half starved, who, nevertheless, are remarkably prolific, and much disposed to amative indulgence. In all these cases, however, it will be found that the intercourse of the sexes is entirely unrestrained, there being no considerations of prudence, no calculation of means or consequences, but a perfect abandonment to the mere

PLATE VI.

OVARY AND GRAAFIAN VESICLE OF A RABBIT, AT VARIOUS STAGES.

Figure 1 shows a Graafian vesicle from a rabbit, in its primitive state, before its evolution begins.

Figure 2, it is grown larger.

Figure 3 begins to show the blood-vessels.

In Figure 4 the blood-vessels are very apparent, and the black dot in the center shows where it will open.

In Figure 5 the same change is still further advanced.

In Figure 6 the egg is just escaping.

Figure 7 shows the empty vesicle after the egg has escaped.

Figure 8 shows the blood-vessels and the cavity gradually fading out.

In Figure 9 they are still more faint.

In Figure 10 it has dwindled much in size.

In Figure 11 it is still more indistinct, and in

Figure 12 it has become very small, and yellow in color—a true Corpus Luteum.

Figure 13 shows the vitellus, or yellow of a rabbit's egg, with the germinal vesicle in the midst of it.

Figure 14 shows the same fully developed and burst open, so that the granules and the germinal vesicle are escaping,

Figure 15 shows the ovary of a rabbit, with the Graafian vesicles on the surface in various stages of development, but none quite ripe.

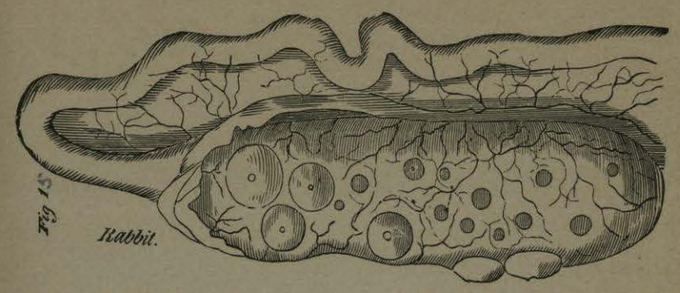
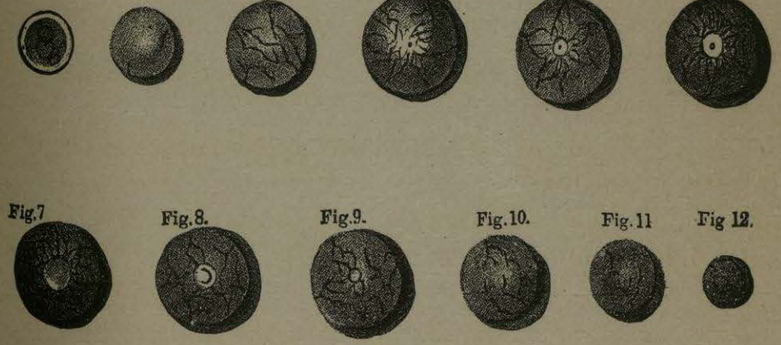


Fig. 14

Fig.13



Ovulation of Rabbit.

sexual impulse. Consequently, marriages occur early, and there is no motive whatever for restraint afterwards. In these people, however, the virile power does not endure so *long* as in those who are better circumstanced, and its exercise being one of the few indulgences left them, they are apt to abuse it.

At the present time, we know of many means by which the power of the ovaries can be either increased or decreased, as may be most advisable, and by which also the egg itself can be made more perfect.

The yellow part, or *vitellus*, is composed of little round vesicles or grains, which are hollow, and filled with still smaller bodies, called *granules*. The membrane which covers each vesicle is also *granulated*, and thus we have first the round egg itself, made up of little round vesicles, and each of these made up again of still smaller bodies or granules, while the covering of each vesicle is also granulated like the interior. There is, in fact, a succession of vesicles, or spheres, one set included within another, as far as we can observe.

The *germinal vesicle*, which is larger than the vitelline vesicles, among which it is placed, is also composed of granules, and is covered with a granulated membrane, the granules in the center of it being much condensed, or crushed together, so as to be opaque, and thus form the *germinal dot*.

The vitellus, or yellow, is the material from which the new being is first formed, and it is found in the egg of the virgin precisely the same as in that of a married person. In fact, the perfect formation of the vitellus constitutes the *ripening of the ovum*, which escapes from the ovary immediately that is formed. Many singular and interesting changes take place in this substance, after the egg enters the tube, some of which throw great light on the manner of the first commencement of the new being. On examining the vitelline vesicles immediately on the escape of the ovum from the ovary, the inclosed granules are seen to be in rapid motion, round a number of different centers, and this motion continues till the primary arrangement of the vesicles is entirely broken up. They then re-arrange themselves in a different order, and begin to form the principal vital organs of the new being. This, however, will be more fully explained farther on.

Another remarkable change which takes place soon after the egg enters the tube, is the escape of the germinal vesicle. This is first placed, as before remarked, in the center of the yellow vitellus, where it is readily distinguished by its greenish color, and by the darker dot in the center. Just at the time when the egg escapes, however, the germinal vesicle mounts to the upper part of the vitellus, the membrane surrounding which then tears open and allows it to pass out. This leaves *an open passage* into the interior of the ovum, which, it will be seen farther on, is essential to impregnation. The germinal vesicle always escapes in this way immediately, so that we can never find it in the egg except at the moment when that is leaving the ovary; after that event we merely discover the rent through which it passed. This is the reason why many microscopical observers never found the germinal vesicle, because they only examined ova taken from the tubes, or uterus, and from all those it had, of course, escaped. The reader will see, from this, what a singular analogy there is between this event and the ovarian expulsion of the ovum. As soon as the vitellus is fully formed the egg is expelled from the *Graafian* vesicle, and immediately afterwards the germinal vesicle is expelled from the vitellus in a similar way.

The yellow vesicles forming the vitellus are disposed so closely that they press

PLATE VII.

OVARY OF A TROUT, WITH THE GRAAFIAN VESICLES IN VARIOUS STAGES OF DEVELOPMENT.

In Figure 1 the vesicles are seen in various stages of development.

In Figure 1*a* they are cut open to show the interior; some of them are dried up into Corpora Lutea.

In Figure 2 they are more advanced, and the eggs are just escaping.

In Figure 2*a* the same are shown cut open; some of the cells from which the eggs have just escaped being filled with blood, while one is dried up into a Corpus Luteum.

Figure 3 shows the ruptured ripe vesicles, after the eggs have been expelled; with many smaller ones at different stages of growth.

Figure 3*a* shows two cells cut open, from which the eggs have not long been expelled. They are still filled with clotted blood, and the internal membrane is beginning to wrinkle up.

PLATE VII.

Fig. 1. *a*

Fig. 1.

Fig. 2. *a*

Fig. 2.

Fig 3. *a*

Fig. 3.

Ovary of a Trout.

upon one another, which makes them not round, but many-sided, like the cells in a honey-comb. In the spaces between the larger vesicles smaller are seen, so that the whole substance is very dense. This may be seen very perfectly in the yelk of a bird's egg, when boiled hard and broken across. The vesicles, like small round grains, can be readily distinguished with an ordinary lens.

Sometimes one or more of the vesicles will burst while we are examining them, and the contained granules will flow out. In such cases they always pass in a steady current, and it takes some ten minutes or more before the vesicle is completely emptied.

To discover all these curious formations and changes requires, of course, numerous and careful observations, with the most perfect instruments, which is the reason why they have not been made before. They are, however, of the greatest value, and until we were acquainted with them, many of the most important generative processes could not be explained.

It was formerly thought that the Graafian vesicles themselves were the ovæ, but Baer, in 1827, discovered the real ovum in the protoplasmic albumen of a vesicle which he was examining with the microscope. As before stated, it is very minute, being in the human being not more than the two-hundredth part of an inch in diameter. Nevertheless, this small body contains similar parts to those found in the egg of a bird, and resembles it in every essential particular.

The *vitellus* or *yelk*, which is the larger part of the egg, is covered by a kind of skin, called the *germinal membrane*, in the midst of which is placed a small round body, called the *germinal vesicle*, and in this is seen a still smaller body, called the *germinal dot*, apparently the real starting-point of the new being. This germinal vesicle is very minute, a good microscope being required for its detection. It is sometimes called the vessel of Purkinge, after its discoverer. The germinal spot is, of course, still smaller. And yet, minute though it be, every human begins with just such a speck. Illustrations showing these particulars in the structure of the egg will be given farther on.

In those animals that bring forth their young alive, these parts comprise the whole ovum, but in those that expel the eggs from the body, to be developed outside, as in birds, a *shell*, with a lining membrane, is superadded for their protection, but this is no part of the real egg.

The outer covering of the egg, or shell, is variable, being sometimes formed of lime, as in the bird, while at others it is tough or leathery, as in snakes, whose eggs are joined together in bunches, like grapes. In some cases the covering is hard and horny, as in the shark's egg. The shape is usually round or oval, though occasionally it is different. The shark's egg is a common object on the sea-shore, and may often be found with the young shark in it. The eggs of some of the lower animals, in the sea, are strung together like ropes.

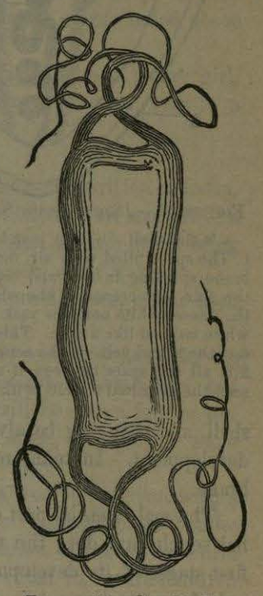


FIGURE 52.—*Shark's Egg.*

The following plates will show the structure of a bird's egg, and of a human egg, so that their real identity can be seen.

It is in the germinal dot that the development of the new bird begins. The germinal vesicle, and its germinal dot, are parts of the egg, and do not result from impregnation. They are found in all eggs, whether the female has ever had intercourse with the male or not. Many people erroneously suppose that the germinal vesicle is the male sperm, but that is a mistake.

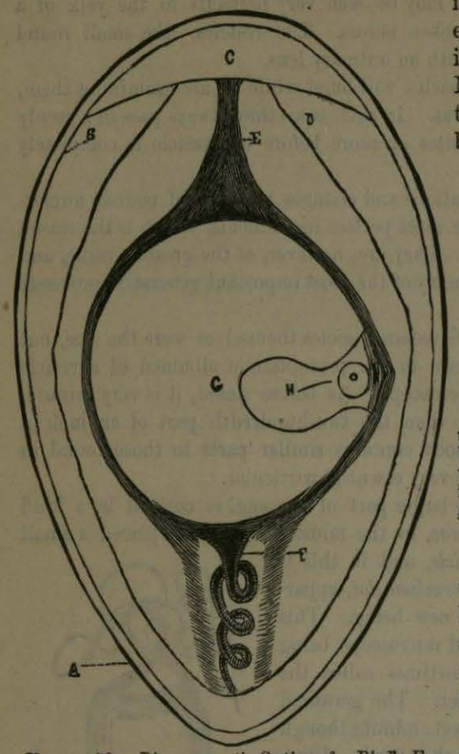


FIGURE 53.—*Diagrammatic Section of a Bird's Egg.*

A is the shell. B. The membrane lining the shell. C. The space filled with air, made by the shell membrane splitting in two and separating. D is one of the thin membranes of the white or albumen. E is the denser white next the yelk. F shows this dense white twisted like a rope. This part is called *chalaise*. G is the round yelk, in the center of the white, which fills all the space between it and the shell. At H is seen the germinal vesicle, with the germinal dot.

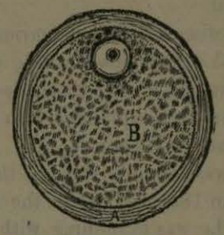


FIGURE 54.—*Ovum of the Human Female,* to show its correspondence with that of the bird. The membranes are the same, but there is no shell. B is the vitellus or yelk, in which is seen the germinal vesicle, and germinal dot.

The strict correspondence between the bird's egg and that of the human being, will be evident from a comparison of the two, as shown in the pictures of both in this article. The eggs of a bird, however, are found in a mass, like a bunch of grapes, and not separately in the ovary, as in the human being. When first formed, they are without a shell, that being gradually added to them during their passage from the body. Frequently, from fright, or injury, the bird will expel an egg prematurely, covered only by the membrane, without any shell, and they may be always seen in that state in the body, in various stages of development. In many reptiles the eggs have no shell, only a thick, tough membrane.

The real essential part of the egg, from which the new being starts, is the germinal vesicle and dot; the yelk, or vitellus, is needed only as nutriment during the first stages of its development. The white is often absent, and the shell is needed only for protection.

The number of eggs in the human ovum is said, by some observers, to be thirty thousand or more. In some animals there are many millions. As before stated, the eggs are formed and expelled in female *children*, even, though they are not perfect till puberty. From this fact it will be seen how early *sex* affects woman.

Before being fecundated, the egg is called an *ovule* or ovulum, and when fecundated, an *ovum*.

The removal of the ovaries in women—called *spaying* in animals—produces effects in them analogous to *castration* in men. Those who are so mutilated have none of that roundness of form usually characteristic of women; the breasts do not grow, the voice is masculine, they do not menstruate, and seldom have any venereal desire. They are made in fact more like men, as castrated men are made more like women. They also change in disposition, character, and habits, inclining more to the masculine nature in every way.

Cows are sometimes spayed, to make them continue to give milk constantly, instead of breeding; and the females of other animals are often so treated to make them fatten quicker. To merely prevent breeding the Fallopian tube is often tied, which merely prevents the semen reaching the egg, or the egg the womb. Male fowls are castrated, or made into capons, so that they may fatten quicker.

In the East, in ancient times, young girls were often castrated, with the idea of keeping them always young, by preventing them becoming mothers. This practice was followed by the kings of Lydia, and especially by King *Gyges*, as we learn from *Hesychius* and others. Doctor Robert assures us that the practice is still pursued in some parts of India, and that he had seen and examined some of these females, who formed a caste by themselves. They told him they had no recollection when they were mutilated, nor exactly what had been done to them.

Occasionally, from disease, and for other reasons, removal of the ovaries has been effected by the surgeon's knife, and when done in early life the effects noted above have always followed.

The celebrated surgeon, *Percival Pott*, removed the ovaries from a young girl, and noticed that she afterwards lost all her bosom, and changed in other ways to a remarkable extent.

In some such cases a beard has even appeared.

There is a curious book to be found in some European libraries, written in Latin, entitled "*Joannis Wieri opera Omnia,*" in which may be found a full account of a pork-butcher, who removed the ovaries of his young daughter, to cure her of being too amorous. The operation, it is said by Wieri, was successful every way.

The removal of the ovaries is often necessary when they are diseased, but is then a serious operation, and very often apt to be fatal.

The spermatic granules in the male semen are called, by some physiologists, the male ovæ, or eggs, and they certainly are as truly such as the ovæ of the female, but in the male they produce the spermatic animalcules, as will be shown farther on. This shows that male and female are fundamentally the same, or have the same parts developed in different ways.

M. Coste directs attention to the interesting fact, that a woman pregnant with a female child, really carries in her body three generations of human beings besides herself. There is the generation represented by her own ovaries. There is her child —and in that female child are the rudimentary ovæ from which its future children may be developed.

This may serve to show how far the injurious consequences of any mental, moral, or bodily derangement in a pregnant woman may extend.

Although, as before stated, the eggs are formed regularly when there is no intercourse with the male, the same as if there had been, still there seems no doubt that

sexual intercourse often hastens their formation, and probably makes it more perfect. Even sexual excitement alone has its effect on the ovary, and will often even cause a partial and imperfect development of an egg!

M. Pouchet gives several instances of this *virgin conception!* Sometimes he found little sacs, or pockets, in the womb or ovary, which contained hairs, bones, teeth, membranes, and fibers. The excitement was apparently sufficient to *commence* development, but could not continue and perfect it. In such cases the formations are always irregular and imperfect, but in one case a tolerably well-formed jaw was seen, containing teeth. Hufeland tells us that he once dissected a woman thirty years old, who had long been addicted to masturbation, but who had never associated with men. He found in the left ovary a kind of sac, eight inches long by five wide, containing a quantity of hair, bones, and cartilage, with a fragment of a jaw, containing rudimentary teeth, like those of a young child.

These cases of partial and incomplete development of the egg, probably all resulted merely from sexual excitement alone, without any concurrence of male semen, and it is possible that many diseases of the ovaries in unmarried females originate in the same way; especially when they are strongly amative.

In many insects there is found, in connection with the ovary, a curious instrument, called the *ovipositor*, a kind of flexible needle, with a strong sharp point. This is used to bore holes in the ground, or in the bark of trees, or other bodies, in which the eggs are placed to undergo their development. Many insects do much mischief by stinging trees in this way. The gall-nuts, seen on the oak, result from a puncture by the ovipositor of an insect, and each one of these balls, when fresh made, contains one or more eggs.

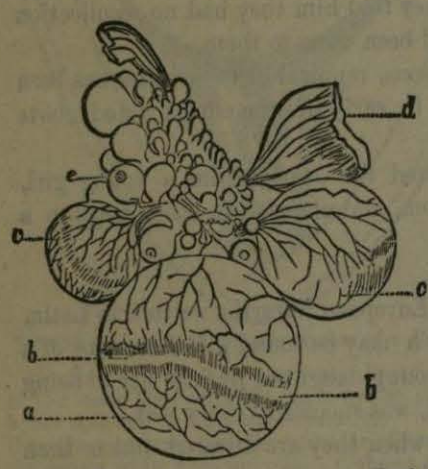


FIGURE 55.—*Ovary of the common Fowl.*

These sacs, or bags, are the Graafian vesicles, like those in the human ovary. When the egg in one of these vesicles is ripe the sac bursts open, and the egg is discharged, just as in the human female. At *d*, one of them is seen burst open, having parted with its egg; the other letters show Graafian vesicles at various stages.

The ovaries are double in nearly all insects, and are composed of a variable number of separate tubes, in some cases as many as thirty to a hundred or more, in each ovary. The number of eggs an insect will produce depends upon the way in which these tubes are divided; some will lay two, four, six, or eight eggs, others sixty or seventy, and others again several thousands. Some of the ants produce so many that the number is actually incalculable. In beings of this kind, as in the hive-bee, for instance, every generation is produced by one female only, who lays all the eggs. No other female is produced, unless she should die, and the sexual organs of all the other bees remain undeveloped, not being needed.

In some insects and crustaceans there is also a remarkable apparatus, called the *spermatheca*, in which the male semen is deposited and kept for use as wanted. This is especially the case with those insects that take a long time to place their eggs, with the ovipositor, each one of them as laid having to pass by the spermatheca to be fertilized. In the hive-bee the spermatheca retains the semen so perfectly that one connection with the male will impregnate all the eggs the female lays in two years, —some twenty or thirty thousand.

In spiders there are two ovaries or egg bags, one on each side of the body, quite separated from each other, and each having an opening of its own on the outside of the body. They are so totally disconnected that the eggs in one bag may be fecundated and discharged while those of the other are unaffected.

Audebert tells us that some spiders are made fertile for two years, by one association with a male.

The eggs of birds are formed like a bunch of grapes, as before stated, and develop in succession. As they become ripe they are detached from the ovary, and enter the *cloaca*, or passage common to the dung and urine. It is during their passage from the ovary that they acquire the shell and its membrane.

Although there are two ovaries in birds, the eggs are nearly always produced from the left one alone, the right being only rudimentary, or wasted away.

We will now give some beautiful illustrations of the ovaries, with the Graafian vesicles and ovum, in various stages of development. These are taken from that splendid work of M. Pouchet, "*L'Ovulation spontanée.*" They portray the ovary of the human female, and also that of the rabbit. The process is exactly the same in both, and as in the rabbit the parts are larger, and more ova are developed at a time, the illustration is more instructive. In the rabbit, also, they can be taken *at any known period*, which cannot of course be done with the human female.

By studying these plates, in connection with the explanations already given, the whole process of the formation and expulsion of the egg, in the human female as well as in other animals, will be readily understood.

THE TESTICLES AND THE SEMEN.

The most essential organs in the male system are two glandular bodies, called the *testes* or *testicles*, which are placed, after birth, outside of the body in an external envelope, called the scrotum, hanging from the pubic bone. The use of these organs is to produce the male principle, or *semen*, as the ovaries produce the female ovum or egg. The testes, like the ovaries, are not capable of performing their proper functions till a certain period of life, called puberty, but, unlike them, they are not liable to lose their powers at any particular age, but may preserve them indefinitely. In the early stages of existence in the womb the testes are contained in the abdomen, and only descend to the scrotum just before birth.

On dissecting one of the testicles, it is found to be chiefly composed of blood-vessels and numerous small tubes containing semen. A branch of the spermatic artery is sent from the abdomen down to each teste, in which it divides and subdivides into thousands of little branches, many of which are too small to be seen by the naked eye. It is this artery that brings to the testes the pure blood from which probably the semen is formed. The extreme ends of the minute arterial branches are apparently continuous with the commencements of the seminal tubes, so that in examining them we gradually lose sight of the blood and begin to find semen. The seminal tubes are at first exceedingly minute, but very numerous, and they gradually unite together to form larger branches, and trunks, till eventually the whole form but one tube, called the *vas deferens*, by which the semen is conveyed to the urethra. The number of these little tubes has been estimated at over *sixty thousand* in one testicle, and it has been shown, that, if they were put in a straight line, they would measure many hundreds, if not thousands of feet. There is also a