

it has attained its full growth, the ligament breaks and the egg is dropped into the canal, or passage, by which it is to escape from the body. It then consists merely of the vitellus, or yellow, and the cicatricula, or germinative vesicle, but as it proceeds along the passage, the white, or albumen, is deposited around it, and the shell forms around the whole, till it assumes the form we usually see. The shell and the albumen, therefore, are mere extraneous matters, and not essential parts of the egg or ovum, though necessary to its protection and development when out of the body, and it is not unusual for the egg to be expelled without them, especially when the bird is diseased, or not provided with sufficient lime for the shell.

The true definition of a viviparous animal, therefore, is one whose egg cannot develop without being connected with its body, while the egg of an oviparous animal is capable of developing alone, merely by the application of a proper degree of heat.

The truth of the Second Law is obvious in respect to all oviparous animals, especially birds, who are known to have eggs, and to lay them, before being impregnated, but it is not so obvious in respect to viviparous animals, whose eggs are so small that they are only discovered by the microscopical anatomist. A consideration of the facts already adduced will prove, however, that in the whole class, mankind included, the law also prevails, and that eggs are formed and expelled in them also independently of impregnation. The celebrated Harvey was convinced of this fact, though he had not the proof of it, and he laid down an axiom, in accordance with his conviction, which can now be received without question—"Everything living," said he, "comes from an egg." There are some of the lower animals, it is true, that seem to reproduce their young without eggs, by *fissiparous* or *gemmaiparous* generation, but these are now known to be only modifications of the oviparous process. In *fissiparous* generation the parent simply splits up, or divides spontaneously, into two or more parts, which grow into new beings that also divide again in their turn in the same way, and thus the species are continued. The fresh-water *polype* is an instance of this mode of generation, and if it be cut into pieces with a knife each part will grow into a perfect being, which may also be divided in the same way, apparently without limit. In *gemmaiparous* generation the original being simply gives out little buds, or germs, from its body, which develop into perfect beings, as we see in the sponge and the hydra; the buds being sometimes cast off to develop alone, and sometimes all remaining attached to the parent till a large bed or mass of them is formed.

These animals that propagate by the fissiparous process are all exceedingly simple in their organization, and many of them may be turned inside out, like a glove, without the slightest injury or inconvenience. It is probable, therefore, that the whole being is merely like an ovary, and that every atom of it is a germ or egg, capable of development alone, like the bud of a tree. Those that propagate by the gemmaiparous process are also very inferiorly organized, and in all probability the buds or germs which they give off are really ova, or eggs, expelled spontaneously. In fact, many of these beings propagate by the oviparous mode as well, and their whole substance seems to resolve itself into germs of new organizations.

The Third Law says that the semen cannot reach the eggs, to impregnate them, while they remain in the vesicles of the ovary, and a slight consideration of the numerous obstacles interposed will show that this must be so. In the first place, the action of the Fallopian tubes, and the cilia which line their interior, as before explained,

is such that nothing can pass *towards* the ovary from the womb, but only in the other direction. And besides this, while the egg is in the vesicle it is surrounded by a number of different membranes, either of which would present an impassable barrier to the semen, even if it could reach the exterior of the ovary. But there is still another obstacle if these were overcome, as if nature had taken special care that no such event should take place. The interior of the tube is compactly filled with a thick mucus, in which the cilia work, and through which the semen could not possibly force its way. In fact, there seems to be considerable difficulty even in forcing the egg down the tubes the right way, and it is probable that very frequently it does not pass down before its structure is broken up, so that it cannot be impregnated. This is apparently the reason why there are but few women who continue to bear children uninterruptedly, most of them having more or less interval between, frequently of years. They form the egg regularly every month, and might conceive therefore *every ten or twelve months*, but all the eggs do not reach the womb in time, a large number of them being so long in passing down the tubes that they are spoiled before the semen can reach them. Perhaps this is an express provision, to prevent women from being debilitated by sickness, and worn down by anxiety, as most of them would certainly be if they were to bear children continually. With human beings there are many considerations which make it undesirable for reproduction to be frequent, and this is probably a natural check. Some females, it is well known, are not restricted in this way, but continue to conceive regularly a short time after every delivery. In such persons there is no doubt a uniform transmission of the egg, which, therefore, always reaches the womb in a state fit for receiving the male semen. In many cases of barrenness also, I find that stimulating the Fallopian tubes, at the proper time, will remove the disability, apparently by quickening their action, and causing the egg to reach the womb earlier, and in a better condition for being impregnated.

The old theory of impregnation was that the semen was absorbed, or sucked up, into the womb and along the Fallopian tubes till it reached the ovary, when it impregnated one of the eggs and so stimulated it to commence developing. It was then supposed that this impregnated egg, after a time, separated from the ovary and passed down the tube into the womb, where it formed into the foetus. The facts just mentioned, however, show the fallacy of this theory, even if the correct process had not been given before, but still it has been received so long, and has become so *orthodox*, that many celebrated men hesitate to reject it even now.

Abundant proof has been obtained that the thick portion of the semen must actually touch the egg itself, without any obstruction, or there can be no impregnation. Spallanzani proved this by his experiment upon the eggs of fishes. He found that if semen from the male fish were put into the water, along with the female eggs, they would, after a time, begin to develop, and ultimately form into young fishes, but not if the semen were kept away. He then filtered the semen, and tried the thin part of it, but that had no effect, though the thick part, which contained the animalcules, impregnated immediately. Some physiologists had concluded that it was merely the *aura*, a kind of steam from the semen, which impregnated, and he therefore exposed some of the eggs to this steam, for various periods of time, but always with no effect. The same results have also followed experiments made upon animals, by myself, for in no case did impregnation follow from the mere *aura* of the semen, though it was applied directly to the mouth of the womb, as well as in the vagina. It is therefore certain that the thick semen itself must touch the

egg, and this it cannot do while the egg is in the vesicle of the ovary, because it cannot reach the ovary.

The Fourth Law asserts further that before the egg can be impregnated it must have acquired a certain development, and must have separated from the ovary. Reason alone would assure us of this, because it is evident that the egg must be perfectly formed before it could be affected by the semen, and when it has attained this stage it is *ripe*, and is cast off from the ovary like a ripe fruit from the tree.

The precise period when the egg leaves the ovary appears to be when it has exhausted all the nutriment in the vesicle, as evidenced by the complete absorption of the white fluid, and it is detached in order to seek the means of further growth elsewhere, as the ripe seed of the plant is thrown to the ground.

In the great majority of animals the egg is not impregnated till it has passed a long way from the ovary, which is usually deep within the body, and sometimes it even leaves the body before it is fecundated. The eggs cannot be impregnated if taken from the ovary, as experiment has proved, but they must have left it spontaneously, and sufficiently long for the peculiar change we have before explained to take place in them. Impregnation could not take place, therefore, from the semen reaching the ovary, even if its passage there was possible.

In the case of the bird, the egg is impregnated immediately it leaves the ovary, before the shell is formed over it, but not while attached by its ligament. The female bird is provided with a peculiar pouch or receptacle, into which the semen is absorbed at the time of copulation, and in which it will remain unchanged for a long time. This pouch is so placed that the egg passes by it on leaving the ovary, and in such a manner that it absorbs a portion of the semen contained in it, and thus becomes impregnated. The quantity of semen thus stored up is something considerable, and as only a small portion is needed to fecundate each egg, it is possible for a single copulation to impregnate all the eggs that may be laid for a long time after, as we often see in the common fowl.

In some animals the egg is not perfect enough for impregnation even when it leaves the ovary, but is kept for a time longer in a peculiar organ provided for the purpose, in which it matures more perfectly, and is then expelled into the passage to meet the semen. This is the case with many fishes and reptiles, and if the egg be taken before its sojourn in that peculiar organ, it cannot be fecundated.

It is evident, therefore, that the egg must have attained a certain development before it can be impregnated, and that it must also have left the ovary for some definite time.

The Fifth Law, which asserts that in all beings the eggs are formed and leave the ovary independent of impregnation, is almost proved sufficiently by the facts already adduced, but a few additional observations will make it still more clear. With respect to birds, this law was long known to be correct, because they frequently produce eggs without having ever had any connection with the male; and it was also equally evident in regard to most fishes, whose eggs are impregnated after they leave the body. In frogs also, as before stated, the male deposits his semen on the eggs as the female expels them from her body, which proves that their formation and expulsion is independent of impregnation. The difficulty in proving that this law applies to *all* beings, especially to the human being, arose from want of proper observation, and from the supposition that the egg in them was in some respect different to that of oviparous animals. Now that the universal similarity of the egg is proved, how-

ever, and that we know it is produced by a similar process in all, it is also made evident that it is formed and emitted independent of impregnation. In fact, one essential part of the egg, the vitellus, from which part of the new being is formed, is found in undoubted virgins, and even in children occasionally, when it could not, of course, have had its development influenced by impregnation.

Nevertheless, it must be observed that sexual excitement may hasten the ripening of the eggs, because it may excite the ovaries, and expedite their functions, as our former observations have shown. In some cases it even appears that the egg will partially develop from mere excitement, without any contact with the male principle, as several instances already given have proved. In this way are produced those imperfect foetal growths occasionally met with in the ovaries, and which have been found even in children. And in the same way, in all probability, arises that partial development of the new being found sometimes in the unimpregnated egg of the bird, many instances of which are upon record.

In short, the growth and expulsion of the egg is a process belonging to the female system alone, and no more requires the influence of the male, in any way, than he requires the influence of the female to cause the testes to form the semen. Many females, who possess sufficient physiological knowledge, and who have been observant of their own systems, know precisely the time when the eggs leave their bodies, and can readily obtain them every monthly period. This I have known many do, and it is sometimes necessary in determining the causes of sterility, which occasionally results from the egg being imperfectly formed, and we cannot ascertain whether they are perfect or not without examining them.

The Sixth Law merely states that in all animals the expulsion of the egg occurs at regular intervals, varying in their duration in the different kinds. In some beings there is only one expulsion during their lives, and this usually terminates their existence, as we see in many insects. In some the expulsion is annual, in others, biennial, and in others again every three years, and sometimes it is as often as daily; in the human being it is monthly. This regular ovarian expulsion also occurs along with the periodic excitement called the rut, or heat, in the lower animals, and the monthly period, or menstruation, in the human being. In fact, the periodic excitement results from the periodic expulsion, and both are parts of one grand phenomenon.

This periodic excitement, especially as it appears in the form of menstruation in the human being, exerts a most potent influence over the rest of the system, and makes the female in many respects essentially different from the male, as fully explained in our article on Menstruation. It commences first in the ovaries, but is propagated from them to the whole of the generative apparatus, and sometimes even to remote parts.

The excitement caused by the expulsion of the egg is not, in the inferior beings, accompanied by such a discharge as we observe from the human female, though in nearly all there is some secretion, and in particular species it is even colored. In all cases, however, the excitement of the parts is obvious enough, and is sometimes quite remarkable externally. In some of the apes not only are the external genitals inflamed, but also the parts around the anus, and even the thighs, which are sometimes covered with large tumefactions, of a bright red color, during every period. In all birds the inflamed condition of the external parts, while they are laying, may be readily seen, and it is observable also in fishes. Occasionally this external excite-

ment occurs in human beings at such times, and some females are always troubled then with swollen labia, or eruptions on the skin.

In every instance the excitement and flow is terminated by the expulsion of the egg from the ovary, which constitutes the crisis. In no instance is there any excitement, or flow, in those females that have been castrated, because they can have no expulsion of ova, but in all those whose functions are natural, the excitement occurs at regular periods, and is always accompanied by the maturation and discharge of ova.

When animals are domesticated their periods are considerably modified, being usually hastened, but still they almost invariably observe a certain degree of regularity. Many females are also much affected by their mode of life, being made to menstruate, or flood, almost continually, by the influence of stimulating food and drink, and by too much artificial heat.

The Seventh Law enunciates a most important truth, which is the foundation of much valuable advice, and gives us the key to the true time of conception. It states that conception can never occur except when the male semen is deposited in the female organs at the same time that a ripe egg reaches them, or, in other words, for a copulation to be fruitful it must coincide with the expulsion of the egg. The truth of this will be obvious from our previous statements, for it is evident that if the semen cannot reach the egg while it is in the ovary, and that has been shown to be impossible, it can only do so after it is expelled and brought into or near the womb. In fact, the egg has some further change to undergo after it leaves the ovary before it can be fecundated, and this is the reason for its being somewhat delayed by passing down the tubes. This law is strictly in accordance with the fact before mentioned, that the expulsion of the egg takes place just when the flow is over, as that is the time when conception really occurs, and when most animals also desire association. It is not at the commencement of the rut that female animals desire the male, but after the discharge has continued for a few days, and just when it is ceasing. The slut, for instance, will repel the dog at first, and so will the female rabbit repel the male, and even fight with him, until about the third day of heat, and then she submits. This is evidently because the eggs have not descended till that time, and nature has so provided that association shall only be sought when it is likely to be fruitful. If any of these animals were compelled to copulate during the first days of the excitement there would be no fecundation, because the presence of the semen does not then coincide with the presence of the egg.

The Eighth Law is merely a distinct enunciation of a truth already abundantly proved, namely: that the menstruation of the human female is identical with the peculiar excitement observed periodically upon all other animals, and called the rut, heat, or œstrum.

According to the Ninth Law, it is possible, at least in the human being, to designate the precise time when conception is possible, and also that in which it is impossible. This law also follows naturally from the foregoing explanations, they having shown that the egg remains but a certain number of days in the womb, after which it passes from the body and is lost, and since the semen can reach the egg only while it is in or near the womb, it is evident that the days during which it stays there are the only ones in which conception is possible, and that at all other times it is absolutely impossible. When we have ascertained, therefore, the precise time which the egg stays in the womb, and tube, we know to a certainty the time when

conception can occur, and also when it cannot. In another article I shall point out this time accurately, and explain how it is ascertained.

The Tenth Law is important because it shows where fecundation occurs. According to this law the two principles can only meet in the uterus, or at the uterine ends of the Fallopian tubes. The proofs of this are many and various, and quite sufficient to put its truth beyond a doubt. In the first place it must be borne in mind that the semen cannot pass down the tubes, as already shown, and consequently cannot get farther than the womb. In fact, if animals be killed as long as twenty-six hours after connection, the semen is still in the womb, and if killed after that time it has gone no farther, but has begun to decompose. In some few cases it has been found a little way within the Fallopian tube, and once or twice nearly as far as the middle of the tube, but no farther. In no instance have the animalcules of the semen been found on the ovary, nor beyond the middle of the tube, though sought for in hundreds of cases. It is true that in some cases anatomists have thought that they discovered the animalcules upon the ovary, but it is now generally admitted that they were mistaken, and their error probably originated in this way: There are often fragments of mucous membrane, partly organized, which much resemble the animalcules, and without very close inspection may readily be mistaken for them. These are called *false zoospermes*, and in all probability it was some of those that came under view. Every accurate observer has failed to detect them in any other parts than those mentioned.

WHEN CONCEPTION IS POSSIBLE AND IMPOSSIBLE.

Numerous observations have established the following facts respecting the time of conception in the human being, and they may be relied upon with the utmost certainty.

The Graafian vesicle, which contains the egg in the ovary, enlarges while the menstrual flow is taking place, and it bursts open, to let the egg escape, on the first, second, third, or fourth day after the flow has ceased, but most usually on the first day.

The egg is then taken hold of by the fringes at the end of the tube and carried into the passage, down which it slowly progresses, taking from two to six days to reach the womb.

The time, therefore, in which the egg reaches the womb, varies from one or two to ten days after the menstrual flow has ceased.

When the egg reaches the womb, it would—if there were no special provision to prevent it—immediately fall down to its mouth, and escape from the body, but this is provided against. While the egg is passing down the tubes, or during the latter part of the flow, a peculiar delicate membrane, or skin, called the *decidua*, forms around the inner walls of the womb, so as completely to block up its mouth. This membrane presses against the opening from the Fallopian tubes also, so that when the egg passes out of the tube it pushes against the membrane, and makes a hollow, or kind of nest, in which it lies. This, therefore, prevents the egg from passing immediately away, and it evidently must be retained in the womb as long as the decidua remains.

The time that the decidua remains attached also varies from two to six days, but usually it is about four, and at the end of that time, unless conception occurs, it

looses from the walls of the womb, passes out of its mouth, down the vagina, and takes the egg along with it, so that both leave the body and are lost. If impregnation takes place, however, or, in other words, if the male semen reaches the egg while it is thus detained, it remains, and both it and the decidua grow fast to the womb. The egg then forms the rudiment of the new being, and the membrane becomes one of its coverings or envelopes.

When the egg and the decidua have fallen, or, in other words, when the egg is thrown out of the body, there cannot, of course, be any conception till another period comes round, because there is no egg in the womb to be impregnated. After this time, therefore, conception is *impossible*, and its maximum limits at least may be stated with certainty. From the above statements it will be seen that the egg reaches the womb some time between the second and tenth day after the menstrual flow has stopped, and that it then remains there from two to six days at the utmost, but after that it passes away. Consequently, *conception is possible as long as sixteen days after every monthly flow has stopped, but after that time it is impossible!* In fact, it is hardly ever the case that it can take place so long as sixteen days after, because the egg is seldom more than two days in reaching the womb, and if it remains six, as an extreme limit, *eight days* is probably about the average. If the truth could be ascertained, I have no doubt but that nine out of every ten pregnant females have conceived within the first *seven days* after the flow, and that impregnation would not follow connection after the *tenth day* once out of fifty times, but still it is requisite to state the latest *possible* time, and that is *sixteen days*.

An instance illustrative of this principle is recorded in history. Henry II. of France had been long married without offspring, and had consulted various medical men as to the cause, without success, till he sent for the celebrated *Fernel*, who, upon due consideration, simply advised him to always associate with his spouse *immediately after the cessation of her periods*. This advice was acted upon, and she conceived, after being childless *eleven years*. In all probability the egg escaped in her case *very soon*, and association had never before been had till after it was lost.

Every other being also has its limited time, but it is various in different kinds. I have ascertained it in several, and invariably, if they were not allowed to associate with the male till that time was passed, they never conceived. There are signs, however, by which any intelligent and observant female can ascertain that time in her own case, and those signs we will now explain.

Some time within the first five or six days after the cessation of the flow, but usually on the first or second, all females experience a sensation of weight and uneasiness, or of slight pain, in the region of the Fallopian tubes, or across the abdomen, on a line with the lower edge of the hip-bones. This sensation may be very slight in some, but in others it is quite acute, and there are few but what can detect more or less of it if they observe. This indicates the passage of the egg down the Fallopian tube, and is caused by its contraction. In fact, many females can distinctly feel the tubes *drawing* together, as they express it, and sometimes the contractions may even be *seen* externally. Previous to these contractions the mucus discharged from the vagina is usually thick and adhesive, but after they have ceased, it becomes thinner and more transparent. The passage of the egg down the tube is indicated, therefore, by very obvious signs, which, I am confident, are but seldom absent.

The passage of the egg out of the womb, or the fall of the decidua, which makes

conception impossible afterwards, is even more strongly and constantly marked, and can be known by nearly all females. The first indication is an increased flow of thin watery fluid from the vagina, so abundant sometimes as to wet all the external parts, and not unfrequently to cause some little irritation. Occasionally the discharge is tinged of a pale pink, but more usually it is colorless, and like the white of an egg. This may continue only for a few hours, or for a day or two, and is always followed by the escape of a small grayish white clot, somewhat firm and elastic. This clot is opaque, and varies from the size of a pea to that of a small bean. It much resembles the clots which are often coughed from the throat in bronchial affections, and is readily detected. Just previous to this appearing, and when the thin discharge is about ceasing, there is also felt a slight contraction and pain in the womb, accompanied with a feeling of weight and bearing down, similar to what is experienced during the menstrual flow itself. If this clot be examined with a microscope it will be found to consist of *the decidua and the egg*, which have thus been expelled. In fact, the slight pain and distress experienced, are caused by the womb contracting slightly to effect the expulsion, the same as it does during a miscarriage to effect the expulsion of the *fœtus*. This is, then, the phenomenon of the fall of the decidua, or expulsion of the egg, called by the French the *ponte*, or *laying*, and when it has taken place there can be no impregnation till after another period.

In some females this expulsion of the egg is almost as distinctly marked as the monthly period itself, and even causes as much distress. In others, however, all the indications are very slight, but still I believe they are always manifested sufficiently for the time to be detected, if careful observation is kept.

The time when the expulsion occurs also varies in different persons, and under different circumstances. On the average, it is about the *seventh* or *eighth* day, but may be as late as the *sixteenth*, as before explained. The *clot*, of course, is always present at the time, and indicates it beyond a doubt.

I have known many females who have ascertained this time quite readily after the signs had been explained to them, and I believe nearly all would do so with a little trouble. Many of these have even detected and preserved the *clot*, which, on being placed under the microscope, has shown them the egg and its decidua most perfectly. Several of these clots I have in my cabinet, both of the human being and also of animals. Every female who thus ascertains the precise period of the expulsion of the egg, of course knows when conception in her case becomes *impossible*, because it cannot occur after the egg has escaped.

There are, however, many causes that may lead to error, and which may deceive persons very much if they are not acquainted with them. Thus, some females are constantly liable to mere floodings, or discharges of blood, from weakness, which they mistake for real menstrual periods, and thus miscalculate. Others, again, have periods that are colorless, as elsewhere explained, and they, therefore, never suspect what they are when they really do occur. All females are liable at times to these unusual appearances, and are likely, therefore, to suppose that they have a period when they have not, and that they are free from it when it is actually taking place. In this way mistakes are very apt to occur, unless the individual has been sufficiently observant to detect true menstruation by other signs than the mere color. It must be remembered that every discharge of blood is *not* a menstrual discharge, and that many true menstrual discharges are *perfectly colorless*. One sign can be always relied upon, however, to detect the true period, and that is the *odor* of the

discharge, which is so peculiar, that when once known it cannot be mistaken, there being no other discharge resembling it. In an ordinary flooding there is seldom any particular odor, but this peculiar one is always present at every menstruation, though it be as thin and colorless as water.

It is owing to these occasional deviations and unusual appearances that some females have supposed they conceived immediately *before* the period. They had simply experienced a flooding, and mistook it for menstruation. Others have thought that they conceived without having menstruated, especially when nursing but in them it had been colorless and unnoticed.

In very many cases I have made practical use of these facts, when consulted in cases of barrenness, and frequently with the most satisfactory results, as will be shown when speaking upon that disability.

In every instance—it may be confidently relied upon—conception takes place within *sixteen days* after a menstrual period, and usually within *eight or nine days*, though it may be often difficult to ascertain the period, and another phenomenon may be mistaken for it. At all other times impregnation is absolutely *impossible*, excepting possibly for a brief period before the actual cessation, in the way that will be explained in our next article.

MANNER OF IMPREGNATION.

The precise manner of impregnation, or the way in which the two principles actually unite, can only be understood by bearing in mind the account given of the semen in a former article. It was there shown that the essential part of this principle consists of certain little living beings, called the *seminal animalcules*, which, undoubtedly, are the true impregnators. If they are absent, or if their vitality be destroyed, the semen has no effect whatever on the egg. This fact has been ascertained for some time, but it is only recently that the mode in which they operate has become known.

When speaking upon the female egg, in a former article, it was stated, that while in the ovary it contained a peculiar body, called the *germinal vesicle*, which, by a spontaneous movement, was cast out as soon as the egg entered the tube, in such a way as to cause a rent, or torn place, in the membrane surrounding the egg. This bursting open of the ovum had been noticed by many observers, but the object of it was long a mystery, till, fortunately, a curious discovery revealed its intention. It was found that if one of these seminal animalcules came in contact with an egg, which was opened in this way, it immediately *crept* in at the opening, and *buried itself in the interior*. The object, therefore, of the passing out of the vesicle, is, evidently, to open a passage, by which the animalcule can reach the interior of the egg, among the vitellus, or yellow, and when there it forms part of the rudiment of the future new being, as will be explained farther on. In this way, then, the two principles really unite, each being indispensable to the other, and the two together providing all the elements for the embryo,—the animalcule probably being the germ of the nervous system, or that part in which *animal life* really resides.

This also explains other circumstances formerly noticed, and shows that every peculiarity exhibited by either of the principles has its object. It was stated, for instance, respecting the animalcules, that they had a remarkable tendency to move in a straight-forward direction, and with considerable velocity. Now this tendency

is evidently calculated to carry them up into the womb, so that they may reach the egg, and without it they might never arrive there. The semen is deposited, during coition, in the vagina, and was always supposed to be *absorbed* or sucked up into the womb, though not known to be so. It is probable that such absorption, or suction, does take place sometimes, but by no means invariably I am convinced, and I have no doubt whatever, that conception can occur without it. Many females habitually lose most or all of the semen after every association, and yet they conceive, though there evidently can occur but little passage of it in either of the above ways. The fact appears to be that the animalcules can pass up into the womb themselves, by their own motion, the tendency above noticed, to move forward in one direction, enabling them to do so. Immediately they are deposited in the vagina, if their vitality is perfect, all that find themselves placed in the proper direction, begin to move upwards, and they continue to do so till they reach the uterus, as nothing seems to make them ever turn in the opposite direction. When any of them reach the interior of the womb, if an egg be there that has been opened by the vesicle passing out, one of them passes in, and thus effects the impregnation. This fact has actually been seen under the microscope, and the entrance of the animalcule within the egg is an undoubted occurrence.

It is easy to see from this, why it is that conception does not occur, as is often the case, when the male is too debilitated to form perfect semen. The animalcules are then too weak to pass up into the womb, and consequently there is no impregnation. Any cause, therefore, which weakens their energy, and prevents their usual lively forward motion, is apt to prevent conception. As long as they are alive, however, provided one of them can be conveyed to the egg, impregnation may be effected, which explains why some females, whose organs act energetically, can conceive from these debilitated individuals while others cannot do so. If the womb has great power it may draw up the semen, and so allow the animalcules to act, though they could not have moved up themselves, as they ordinarily do. In this way the greater energy of the female may partly make up for the exhaustion of the male, while, on the other hand, if the animalcules be unusually vigorous, they may reach the ovum entirely by their own unaided powers, and then impregnate when the female organs are totally powerless. From this we see why it is that conception can occur during sleep, or even during perfect unconsciousness from drugs, or blows upon the head, though most persons suppose otherwise. This has been proved, however, by numerous cases in human beings, as well as by direct experiment upon animals, and the reason will now be obvious enough. The condition of the female, though she be perfectly insensible, may not prevent conception, because the animalcules can move up into the womb by their own powers, and thus impregnate without any knowledge or concurrence whatever on her part. Many cases have been known in which females have conceived after having been violated but once, though people generally, and even medical men, have doubted it, and the possibility of their doing so will be obvious after this. It must be borne in mind, also, that in such cases the brutal violator is usually a man of strong passions, and of great sexual power, which may probably cause the animalcules to be unusually vigorous, and thus increase the likelihood of conception. I once knew a female who became pregnant after violation, during which she was perfectly insensible, but who never became so after marriage; the reason why, it was of course not possible to ascertain with certainty, but it may probably be found in the above explanation.

This also shows how erroneous it is to suppose, as most people do, that a female cannot conceive unless she experiences sexual enjoyment, or if the association be repugnant to her. There are numbers who never knew what the sexual feeling was, and some who have even suffered both pain and disgust, constantly, in association, and yet they have become pregnant. Nor will this appear extraordinary after our explanation, which shows that the female may be quite passive, so much so, in fact, that conception may take place artificially, *without connection*. Experiments upon animals have proved that if the semen be merely thrown into the vagina, at the proper time, with a syringe, it will impregnate. And in some cases of malformation in married men, which prevented proper connection, the same practice has been advised, and with complete success. In fact, the presence in the female organs of the perfect male semen, at the proper time, is all that is needed to cause conception, no matter how it may have come there, nor with what feelings its introduction may have been attended.

It should be observed, however, that though sexual feeling in the female is not absolutely necessary to conception yet, in many cases, it may much conduce to that event. Pleasurable excitement at the time of connection disposes the organs to more energetic action, and some females may possibly not conceive without it, though certainly all do not require it. We know that this excitement makes the tubes contract more vigorously, and this causes them to bring the egg down earlier, and probably, also, it may make the womb contract, so as to draw up the semen more completely. In many cases barren females, of a cold temperament, have conceived immediately after having the sexual feeling produced.

From the foregoing statements it will be seen that conception does not always take place at the moment of connection, nor even immediately after, and we shall soon discover that it may be delayed for a considerable time. As long as a living animalcule remains in the female organs it is possible for it to reach the womb, and thus effect impregnation if the egg be there. We have simply, therefore, to ascertain how long the animalcules retain their vitality, after being emitted in coition, and we shall then know the period during which impregnation may be delayed. In some females the semen is either absorbed, or the animalcules move up themselves, very quickly, so that they are impregnated almost at the moment of emission; but in others there is no absorption at all, and the animalcules may move very slowly. The actual time when the two principles unite, therefore, after a fruitful connection, is very different in different persons. It appears, according to accurate observations, that the animalcules can remain alive in the female organs as long as *twenty-six hours* after they have been deposited there in connection, and it follows, therefore, that the impregnation may not take place till that time after. It is found that they begin to die, usually, after the second hour, and fewer of them are found alive as the time advances. At twelve hours usually half of them are dead, and at twenty hours but few are found living, though one or two have been discovered even at the twenty-sixth hour. As they die they break up, the tail separates from the body, and both parts begin to dissolve. It is possible, therefore, that the impregnation may take place *at any time within twenty-six hours after connection*, and it is manifestly absurd to talk, as some persons do, about the importance of a proper state of mind *at the moment of conception*, as if that moment could be known. Perhaps the most frequent time is about two hours after connection, or when the animalcules begin to die, but of course there will be great variation. When the womb contracts with

energy, or the animalcules are unusually vigorous, the conception will be quick, and when otherwise, the reverse. And this makes it more likely to be quick in those of warm temperaments.

It is barely possible that the animalcules could live through the latter part of the flow, if connection were had before it had ceased, and if so impregnation might follow such connection. Supposing the coition to occur twenty-six hours before the egg reached the womb, some of the animalcules might still be living when it arrived there, and of course could cause its impregnation, though unlikely. This is the only possible way in which conception can be effected before the cessation of the monthly flow. In many cases, however, the egg reaches the womb in less than twenty-six hours after the flow stops, and therefore connection may always cause conception at any early time after, even immediately. The *full time*, therefore, during which impregnation is *possible* is for the sixteen days *after* the flow has ceased, and perhaps for the twenty-six hours before it ceases, at all other times it is impossible.

It may appear to some persons, who have not bestowed full attention upon the subject, that there is danger in making such facts as these known, because, they say, young persons, knowing that there are times when they can indulge with safety, will be led to do so, when they would not if they feared the consequences. All this I have duly considered, and yet have come to the conclusion that there would be no advantage, in any way, in attempting to suppress such truths. In the first place, as society is now constituted, and with the means of disseminating all kinds of knowledge so complete as we have them, it is *not possible* to prevent any interesting fact from becoming generally talked of, if it be known to ever so small a number. Some idea of it is *sure* to get abroad, and most probably an erroneous one, calculated to mislead and do more harm, a thousand times over, than the truth could ever do. If only medical men could read and write, and if it were *certain* that none of them would ever speak of such things, they might be kept secrets, but such is not the case. In short, it is *impossible*, even if it were advisable, to prevent such matters from becoming generally known, in some form or other, and it is far better for them to be known truly than otherwise.

It seems to me also that it is forming a very low and degrading opinion of young persons, especially of females, to suppose that they are only kept from indulgence by fear of the consequences. If their virtue is solely dependent upon this, it is scarcely deserving of the name, and, in my opinion, is not very safe even with the *fear*. I feel certain, however, that there are not many young females who would either be disposed or persuaded to such practices, even if they were assured there was no risk. Those who think that such a disposition is *common* amongst them are very much mistaken, and judge from very imperfect experience. Persons who think so are generally of loose habits and principles themselves, though they may, from caution, disguise it, and their experience of females has usually been of the most unfortunate class, whom they have erroneously taken for correct types of the whole sex. The great majority of females are actuated by far more powerful and more desirable motives than *fear of consequences*, and it is well they are, for that alone would be a wretched dependence. I much doubt if *any one* ever remained permanently virtuous from this fear alone, for some time or other the fear would either be overcome, or means would be found of avoiding the consequences.

A very little consideration will, I feel assured, show the fallacy and injustice of

this imputation, and explode the erroneous doctrine that ignorance is necessary to virtue. If it be true that young persons would practice association if they knew there was no danger, it follows, of course, that they are disposed to such indulgences, and that they are pleasing to them. Now, if this be the case, why is it that we do not find them, at the present time, taking and allowing other liberties, which would certainly be pleasing enough to make them desired, and in which they do know there is no danger? If we are to suppose, in respect to any two young persons, that the *only* reason they do not actually associate is the fear of consequences, we may justly conclude that they are, the whole time, in the habit of all other practices that can in any way gratify their propensities, and which they know *are* safe. No one, I expect, will presume to say that such vicious practices are universal, and yet, if fear alone prevents worse practices, and these are *known* to be perfectly safe, why are they *not* universal? The truth is, as before remarked, that there are, especially in young females, other motives and sentiments of a higher order, which are the true barriers against vice, and when these are absent, fear alone is seldom any safeguard whatever. There are few adult persons, if any, who do not know that association *can* be practiced without danger, by observing certain precautions, which still leave the indulgence pleasing enough: and yet, I presume, no one will contend that such a practice is pursued, though it certainly ought to be universally, if fear of consequences alone restrain, because here there is no danger.

Besides all this, there is another consideration, which should not be lost sight of. If it be contended that young people would immediately seek indulgence when they knew there was no danger, it must be admitted that they are usually in the habit of confidential communication with each other on such matters, and of discussing the chances of escape from the consequences, or else a mutual understanding could not be come to. Will any one either contend or admit that this is the case? I presume not; and I am confident it is not so. With all virtuous—or even commonly decent young persons, before marriage, such subjects are never spoken of in a familiar manner, and any attempt to do so in either, would nearly always alarm the other, and put them on their guard. How, then, could the subject be ever introduced between them, so that everything relating to *times* and *periods* could be calculated? The idea is as preposterous as it is unjust, and cannot be admitted for a moment, in reference to young people generally.

It is pretty evident to my mind, that any young persons who would deliberately enter into such calculations, and come to such a mutual understanding, merely from becoming possessed of this piece of information, *could not have been virtuous before*. They must have been in the habit of other familiar practices, and, in all probability, of forming plans, or they could not see any opportunity in this.

It is time now that the people became acquainted with one most important truth, namely, that ignorance is but a poor crutch for virtue, even when it can be maintained, but at the present time it is doubly worthless, from the fact that intelligence is liable to knock it from under the moral cripple at any moment. Knowledge and good principles are far more worthy of confidence, for they will never fail in the hour of need, nor can they be weakened by any additional information fortuitously acquired; whereas, with ignorance, there is constant danger.

It is true there are some people who will make an improper use of any knowledge that can be given them, but that is no reason why all others should be deprived of it. These people are *moral lunatics*, and to withhold all knowledge from others,

on their account, would be about as just and wise as to keep all in ignorance that fire will burn, because some madmen and criminals commit arson.

I have also noticed, that those who express such fear, that, to "*some people*" this knowledge will be dangerous, never include themselves among the number. They will not admit that it is dangerous to them, but fear that others may not be equally good.

It may also be remarked that in *practice* there are so many causes of *uncertainty*, as already explained, that the number of days is not to be always relied upon, as a means of prevention!

The mammalia are all *viviparous*, while birds, fishes, and most reptiles are oviparous. In all viviparous and ovoviviparous animals the egg is impregnated within the body, also in many oviparous.

When the egg is developed out of the body, as in all truly oviparous animals, we commonly say it is hatched, and in the ovoviviparous it is simply hatched within the body.

Female fish deposit their eggs in the water, some in one situation, some in another, and the male, by some instinct, follows and deposits his semen upon, or near them, so that it reaches and impregnates them. The two sexes, therefore, may have no actual association, and may never come in contact. At the present time, as is well known, a knowledge of this fact has been put to an important practical use, in increasing the supply of valuable fish. The eggs, called the *spawn*, are taken in immense numbers from a few female fish, and artificially impregnated with sperm taken from a male. They are then artificially hatched, and when matured enough, are placed in waters it is desired to stock with them.

In this way one female may be made to produce many thousands, the development of which is insured by their being properly protected while young. When left under natural conditions, the bulk of the eggs and very young are to a large extent devoured by other fishes.

Shad, salmon, and other valuable fishes are thus artificially produced every year, by millions, and the eggs of different kinds are sent all over the world to stock new waters.

In frogs there is no copulation, the eggs being impregnated after they leave the female's body, but the male fastens himself to her, in a peculiar manner, so that his sperm reaches the eggs as they come out. In the land salamander, which is ovoviviparous, and breeds in the water, the eggs are impregnated in the female's body, but without copulation; the male merely ejects his semen into the water, along with which it is carried into the oviduct of the female, and there impregnates her eggs, which are hatched within the body and expelled alive.

Some of the ovoviviparous animals produce only eggs at one season, and living young at another. This is often the case among insects. Sometimes even, a female, with a large stock of impregnated eggs in her body, will begin by hatching them within, and expelling them alive, but finally will expel the eggs themselves, to be hatched without, as in birds.

In plants, as already stated, impregnation is essentially and practically the same as in animals. There is the ovum, or seed, analogous to the egg of the female animal, and the pollen, which is the same as the sperm of the male animal, and these two must always be brought together before a new plant can be developed. The two principles are sometimes on the same plant, and sometimes on different