

branch of the spermatic vein connected with each of the testes, which ramifies in its substance similarly to the artery. This vein is to take away the blood when it has become impure and imperfect.

The testicles are therefore mainly composed of three kinds of tubes, or vessels, namely, *arteries*, *veins*, and *seminal tubes*. In addition to which there are also numerous *nerves*, and *lymphatics*, or absorbents, the whole being connected together by a cellular substance or tissue. Each one is connected with the body by what is termed the *spermatic cord*, which is a kind of sheath, or tube, about half an inch in diameter, containing the main branches of the artery, nerves, and lymphatics, going to the teste, with the main branch of the vein, and the vas deferens, coming from it. This spermatic cord ascends into the abdomen, where the different vessels composing it are distributed to their respective places. Each teste is also surrounded by a distinct coat, or *tunic*, beside the scrotum, or outer skin, in which both are inclosed.

The manner in which the semen is actually made is explained elsewhere; we can only point out now the place where it originates, and explain its progress toward the exterior of the body.

The vas deferens from each teste, into which all its seminal tubes have poured their contents, ascends into the abdomen through the spermatic cord, and rises nearly as high as the top of the bladder, behind which it turns, and then begins to descend till it meets, near its lower

part, with two small organs called the *seminal vesicles*, with which it becomes connected. From the seminal vesicles the semen passes down a small tube called the *ejaculatory canal*, which is attached to the bladder, and which joins immediately under it, an organ called the *prostate gland*. Finally, by means of some minute openings through the prostate gland, the seminal fluid is passed into the *urethra*,

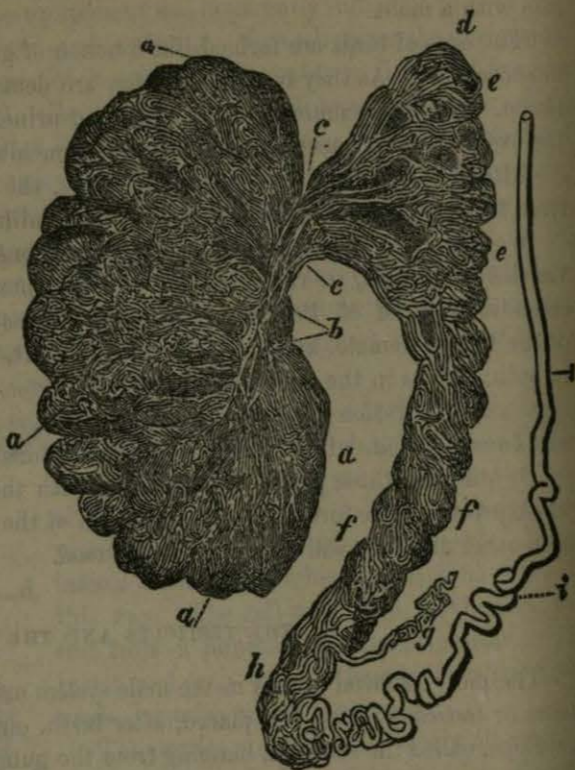


FIGURE 56.—Seminal Tubes and Appendages of the Testicles.

*a, a, a.* Lobules of the small seminiferous tubes, similar to the convolutions of the brain. *b.* The rete testis, a number of nearly straight tubes into which the smaller ones enter. *c.* The vasa efferentia, or larger tubes, 12 or 18 in number, into which the semen passes from the rete testis. *d.* Plexuses, or conglomerations of the vasa efferentia, which form a kind of head, almost like a small testicle, called the epididymis. *e, e.* The head of the epididymis. *f, f.* The body of the epididymis. *g.* An appendix of the epididymis, called the *aberrans*, which is not always met with. *h.* The tail, or cauda of the epididymis. *i, i.* The vas deferens, which is at first very much twisted, but becomes finally straight.

From this view it will be seen, that the small seminal tubes gradually merge into the large straight ones, called the *rete testis*, then into the still larger, called the *vasa efferentia*, and finally they all coalesce into one tube, the *vas deferens*.

or passage down the penis, by which the urine escapes from the bladder, and is thus ejected from the body.

These several parts comprise the whole male generative system, and in the act of impregnation each one has a special function to perform. The testes secrete the semen, the vas deferens and ejaculatory canal convey it to the urethra, and the penis deposits it in the female organs, while the seminal vesicles and prostate gland either secrete some necessary addition, or effect some modification in it.

As before remarked, the testes are usually two in number, the one on the left side being lower and larger than that on the right. But sometimes more than two appear to exist, and at other times only one, or perhaps none. The arrangement of one being higher than the other, when there are two, prevents them from being crushed together when the limbs are crossed, by allowing one to slide over the other. The internal structure of them having already been explained, it is only requisite further to describe their envelopes and attachments.

Immediately around each one is an envelope, or membrane, called the *tunica albuginea* or *peri-testis*, which surrounds every part, and also sends branches, or leaves, into the substance of the testicle, so as to divide it to a certain depth into lobes, or sections, similar to the lobes of the brain, only of a triangular shape.

The outside inclosure is called the *scrotum*, or purse, and is the same as the skin of the thighs. It is divided vertically into two parts by a small ridge, called the *raphe*, and is usually covered with hairs at puberty. Underneath the scrotum we next find a reddish cellular membrane, called the *dartos*, which makes a separate sac for each of the two testicles, which are separated from each other by a vertical membrane placed between them, called the *septum scroti*, which acts as a partition, and thus the two organs are perfectly unconnected with each other. The nature of the *dartos* has been a subject of dispute among anatomists, some considering it to be merely a cellular tissue, and others thinking it to be a muscle. It is undoubtedly partly muscular, and consists mainly of long fibers, which cross and interlace each other in every direction. It is the contraction of these fibers of the *dartos* that corrugates or wrinkles the scrotum, as is well seen when sudden cold is applied to the external parts. Next under the *dartos* comes a true muscular coat, called the *cremaster muscle*, or *tunica erythoides*, the use of which is to draw the testicle upwards. This is derived from one of the muscles of the abdomen, and comes down through the abdominal ring, forming part of the sheath of the spermatic cord. The last coat is called the *tunica vaginalis*, which is a true serous membrane interlaced with blood-vessels, and comes next to the *tunica albuginea*.

In a healthy state the muscular fibers of the scrotum are usually contracted, so as to draw the skin into folds and brace the testes up against the abdomen; but during a state of debility, or from great fatigue, they become relaxed, so that the testes hang low, and pull upon the cord. It is an almost certain sign of ill health when this relaxation of the scrotum occurs, at any period of life, and often its removal is the first indication of improvement. In old people, and in those of a bad habit of body, this relaxed state becomes permanent.

By inspecting antique statuary, it will be seen that the ancients were practically acquainted with this physiological fact, and they have accordingly accurately represented it in their works of art. The figures of all their men in health and vigor have the scrotum invariably drawn up to the abdomen, while those of old men, or sufferers, hang pendent.



As a general rule the muscles of the scrotum are independent of the will, or act involuntarily, but instances have been known of men who made them act as they pleased. Some boys exhibit this power before puberty, being able to draw the testes up to the abdominal ring, and let them fall again, but it is seldom this command over them continues, though one instance is on record. This man drew the testes up into the groin, so as to form apparent ruptures, in order to escape being impressed into the army. Being detected, however, he confessed the trick, and made an exhibition of his extraordinary power to the examining physicians. He could pull up either one alone or both together, and could also make one go up while the other was coming down; in short, he had the same command over them as over his arms, and could move them as quickly. In another instance, a man who was charged with being the father of an illegitimate child, endeavored to evade the responsibility by alleging he had no testicles, and, therefore, could not be the father; but it was discovered that he could draw them up into the groin at pleasure. In a healthy state the scrotal muscles are brought powerfully into action during coition, so as to brace the testes tightly against the pelvis; and one cause of partial impotence in very weak or old people, is the loss of this power, owing to which the semen is not expelled with sufficient force. In children the relaxed or firm condition of these muscles is often a valuable indication of the state of their health.

The form of the testes is that of a somewhat flattened oval, with one end a little larger than the other. The average weight is about one ounce.

The vas deferens, or common tube into which all the small ones are emptied, commences at the *globus minor*, or lower end of the epididymis, and then passes into the spermatic cord by which it enters the abdomen, where its course has already been traced. It is altogether about thirty-two feet long. The sheath of the spermatic cord is composed of two coats, the outer one of which is very firm, like cartilage, so that the tube is not easily compressed; the inner coat is a mucous membrane, similar to that inside the urethra. The cord can be readily felt externally.

This description of the testes and their envelopes, combined with that before given, will be sufficient to give a clear understanding of the various diseases and derangements to which they are liable, and also of the reasons for the line of treatment laid down. It will be seen that they are so placed, without the body, as to have no direct connection with any other organs, and they may, therefore, be removed without any other part being interfered with. This operation, termed *castration*, is sometimes necessary in certain diseases, and sometimes it is the effect of accident, or, in some parts of the world, even of design. The removal of the testes, however, in whatever way it may be effected, not only destroys the power of procreation, but interferes in a remarkable manner with the growth and functions of various other parts of the system, from which it is evident that they are necessary for the perfection of the individual's own system, as well as for the purpose of bringing new beings into existence.

#### ANOMALIES IN THE SIZE AND APPARENT NUMBER OF THE TESTES.

The usual size of the testes is about that of an ordinary pigeon's egg, and their weight, as before stated, is about *one ounce*. Occasionally, however, they are seen much larger, and sometimes much smaller, and their weight may be also considerably greater or less than the average. I have seen them as large as a full-sized hen's egg, yet perfectly healthy, and as small as marbles without being in any way deficient in

power. This is important to bear in mind in many cases that may come under the physician's notice. I have known men hesitate about marrying when the testes were very small, from fear that they would be deficient in power, and it was with difficulty they could be convinced to the contrary. In one instance, of a young man aged twenty-six, they were no larger than those of a child of nine years old, yet his powers were but little, if any, inferior to those of persons generally. After a great deal of hesitation, and much persuasion, he married and became the father of a large family. It is necessary to remark, however, that in these cases all the other organs were of proper size, and that the smallness of the testes had existed from childhood, and was therefore a natural state. If they had *decreased* in size, after having been properly developed, it would have been very different. The falling away or *wasting* of the testes, which follows many diseases, and sometimes takes place without any assignable cause, is usually a serious matter, and is nearly certain to be followed by a loss of power. The injudicious use of certain drugs, particularly of Iodine, will frequently cause the testes to waste, and so will the exhalations from some metals, as lead for instance, many workmen in which I have known so affected. In giving an opinion in such cases, therefore, their previous history must always be known, as well as the condition of the other parts, and the physician will then have but little difficulty in coming to a proper decision. Sometimes one only will be small, and the other of average size, or one only may waste away, without injuring the other.

An unusually large size of the testes should always excite suspicion of its being the result of disease, and a most careful examination and inquiry should therefore be made. If they have always been of that size, or nearly so, from puberty, and especially if the other organs are large also, there may be nothing to excite apprehension. The symptoms of the different diseases hereafter described should, however, be carefully studied, particularly those that cause *enlargement*, as Hydrocele and Hernia Humoralis, for instance. I have known the testes of a youth of *fourteen* to be much larger than those of most men, and yet perfectly healthy; such cases of unusual development are not necessarily accompanied by extra power.

In some instances the development of all the genital organs is very tardy, owing to the slow growth of the testes. I have seen a youth of *nineteen* that was in every respect in the same state, in these parts, as when about seven years old. He was also but very little grown in other parts of the body, having the appearance of one about twelve years old. In this case there were perfect evidences of sexual power, though slight, and all the parts were evidently healthy. It was therefore a case of torpid action, or retarded development, and I thought that in all probability nature could be aroused. I accordingly gave him directions to use stimulating lotions, with frictions and shampooing, and to have a stimulating diet, with regular warm bathing and plenty of out-door exercise. The effects of this practice was soon evident; in less than six months an evident increase had taken place, both in the size of the parts and in the intensity of the sexual feeling. The external parts, which had previously been perfectly bare and smooth, like those of a child, became covered; the voice assumed a more manly tone, the muscles were more solid, the mind more active, and manhood began to dawn. This improvement continued going on till he was twenty-one, when there was but little difference between him and other young men of that age. If this case had not been promptly and properly attended to, in all probability no further development would *ever* have taken place, and an early death would have terminated his imperfect existence. To what age an improvement of



this kind is *possible* we cannot of course tell, though I feel sure it may be effected in older persons than is generally supposed, perhaps till nearly thirty. The younger, of course, the better. Several cases have been known of the testes growing after twenty-six years old.

Sometimes there appear to be *three* testicles, and *possibly* in *some* of these cases there may really be three, but more frequently one of the three bodies is either an epididymis, somewhat enlarged, and much separated from the teste, or else it is a small tumor. Most of those that have been observed in dissection have been small harmless tumors, existing from birth. Three perfect testicles, however, are occasionally found, but they are not always accompanied by any unusual sexual power.

At other times there appears but *one* testicle, or perhaps *none*, and I have known young men in the deepest distress from this cause. In some of these instances there is really but one organ, as has been proved after death, and yet the individual has had full average powers. It is more often the case, however, that these deficiencies are apparent rather than real. Before birth the testes are contained in the abdomen, and they usually descend into the scrotum in the last month. It sometimes happens, however, that the descent of one or both does not take place, and the individual then appears so far deficient. In these cases the power of the testes is not impaired by their unusual position, but perhaps is often increased, and this has led uninformed persons to think that men sometimes had procreative powers *without testicles*, because they could not be found. A man once died in one of the London hospitals who had long been noted as having *no testicles*, and yet having all the usual powers. On dissection, two perfect ones were found in the abdomen that had never come down, and thus the wonder was solved. These cases, however, are but rare. Dr. Marshall examined *ten thousand eight hundred* young recruits, among whom he found *five* in whom the right testicle had not come down, and *six* in whom the left had not; there being but one man in whom both were not descended.

It is much better for the testes to remain totally in the abdomen than to descend only to the groin, as they sometimes do, because in the last position they are apt to be compressed, by the other parts crowding about them in the ring, and then waste away. The partial or complete non-descent of the testes must, however, always be considered an imperfection, and though it *may* not cause inconvenience, or loss of power, these are nevertheless always to be feared. The teste itself is as liable to all its different diseases while in these unusual positions as when in the scrotum, and unfortunately cannot then be reached. The neighboring parts also become affected from it, and thus life may be lost from a simple affection which could have been easily removed, if the teste had been in its natural position.

In some instances the retained testes descend late in life, and if they then become fast in the ring, great swelling and severe inflammation may result, with ultimate wasting away of the organs. Such cases have been mistaken for ruptures, and some men, from want of information, have thought that the testicles really grew at that time, all at once.

When there are really *no* testicles from birth, there is always an imperfect development of the whole system, and a total absence of sexual power and feeling.

In some animals it is natural for the testes *never* to descend, but always to remain in the abdomen, and in others they descend only at certain seasons, that is, when they attain their periodical development, owing to the full growth of the animalcules.

It is stated, on the authority of several travelers, that there is a tribe of *Hottentots*

at the Cape of Good Hope that never have but one testicle; but many naturalists think that more likely it is a custom among them to remove one in youth. It is quite possible, however, that this deficiency may be natural, and it is not in any way more singular than many peculiarities observed in the genital organs of the females of those tribes. I have known two brothers, twins, one of whom had three testes and the other but one.

In some instances the two testes have been found *grown together*, so as apparently to form but *one*, owing to the absence of the usual septum.

The testicles are sometimes drawn so close up against the abdomen, owing to a contraction of the cremaster muscle, that they cannot be discovered without close examination, and are then often thought to be absent, though they are quite perfect, and even outside of the body. Medical men have even testified that there were no testicles, in such cases as these, which shows the necessity for a close and thorough examination of such apparent monstrosities.

This state of things is not dangerous in itself, but had better be removed if possible, because the testes are likely to adhere to the neighboring parts and waste away, so as to cause perfect impotence. A surgical operation is necessary to liberate them, which is both difficult and somewhat dangerous. In some few dissections the testes have been found completely absent, and without any trace of their having existed. Sometimes the vas deferens exists by itself, and sometimes with the epididymis, though at other times there are no traces of either. These cases of total congenital absence are, however, very rare, and are always indicated by deficiencies in other parts of the system.

In some rare instances the testes have descended into the *perineum*, instead of the scrotum, most probably from some imperfection in the parts, existing before birth.

In the course of my practice I have been consulted in many of these cases of testicular anomalies, and have often had the pleasure of removing unfounded apprehensions, and of giving happiness and confidence to those who had previously been the victims of hopeless despair.

The testes are liable to many different diseases and derangements, some from birth, and others that originate afterwards, many of which ought to forbid marriage altogether. A full account of every one, with directions both how to treat and avoid them, may be found in the chapter on diseases of the Male Organs, and if every young man was in possession of that information in time, we should see but few of these diseases compared with what we do now.

Many men are alarmed very much at any affection of these organs—and with good reason, too, considering the inefficiency of much of the medical treatment of them—till very recently. Now, however, some of the worst of these affections, both organic and functional, are cured very readily, and means are used successfully to increase power when deficient, or restore it, in many cases, if lost. Some most extraordinary cases of this kind will be found farther on, that have been treated by myself, and I have also a number of letters from persons who have successfully treated themselves, by following the directions given them.

In those animals the females of which only admit the male during one particular season of the year, that of the *rut*, a necessary adaptation is found in the male, by which the two are made to correspond. The testicles of these animals do not secrete semen continuously, as they do in others, but only at those times when the female



ovaries act, so that both experience the sexual impulse at the same time. At all other periods the testicles are quite small, but then they suddenly enlarge, and when the season is over they decrease again. In some animals the testicles descend from the body only at that time, and at every other period are drawn up into the abdomen. In many, the enlargement of these organs during the time of connection is very evident, even when, as in insects, and some others of the lower animals, there is only sufficient semen secreted for one single act.

According to recent observations, it appears that the seminiferous tubes are about *one two-hundredth part of an inch in diameter*, and that the vas deferens, in all its convolutions, is nearly *thirty-two feet* in length, while the whole of the tubes are, probably, full *five thousand feet*. The epididymis when unrolled will measure over twenty feet in length.

The condition and mode of action of the testes exert a similar influence over the male to that which is exerted over the female by the ovaries, the secretion of the semen being strictly analogous to the maturation of the ova. The development of the body is also totally dependent upon their growth, and both intellectual power and moral disposition are, to an immense extent, influenced by them.

The form of the testicles varies among the different mammiferous animals, equally with the other organs, being sometimes round, at others oval, and at others again long and slender, as in the whale. It is seldom, however, that they are contained in a *scrotum*, as in man, except among the carnivori, the ape, the horse, and the cud-chewing beasts. In the beaver, the testicles are contained in the perineum, and in some similar animals, in the abdomen, while in the bat, and some others, they always glide back into the belly during the rut. The whale, kangaroo, opossum, elephant, and some others, have the testicles fixed permanently in the abdomen, one on each side of the rectum. This is the case also with the porpoise, whose testicles at the time of heat attain an enormous size, having been found nine inches long and four wide, and weighing *two pounds each*.

In all cases the internal structure is much the same, and probably the formation of the semen is always much the same process. The composition of it is also similar, and in every case it possesses animalcules, though they differ in form.

The seminal vesicles and prostate gland also vary in form, though, probably, they always serve a similar purpose. Some animals have only one prostate, like man, while others appear to have several, or rather, it is much divided. Cowper's glands, also, though usually present, vary much in their development, and so do the vasa deferentia.

The testicles vary very much in form in different beings, and also in size, being often very large in proportion to the rest of the body. In the snail (*Helix*), whose double copulation was described in the article *Hermaphroditism*, the testes resemble somewhat a bunch of grapes, as shown in the following illustration.



FIGURE 57.  
Testicles of *Helix*.

All the separate seminal sacs unite, and pour their contents into the common vas deferens, which may be seen proceeding from them. In the entozoa, or body worm, the testes are in the form of a long small tube, which winds round and round the intestines. It occupies a large part of the interior cavity of the animal, and when unrolled is found to be many times its length. One end of this tube

becomes so fine as to be hardly distinguishable, and floats loosely in the juices of the body, from which probably it absorbs the cells that form the semen. The other end terminates in a long tubular penis, which is placed near the opening of the anus.



FIGURE 58.  
Testes of *Scolopendra maritima*, or  
*Centipede*.

*a, a*, are two pairs of testes united in the usual way. *b* shows two separated. *c* is the beginning of the common vas deferens. *d, d*, *d, e*, are other glands joining the vas deferens, not connected with generation.

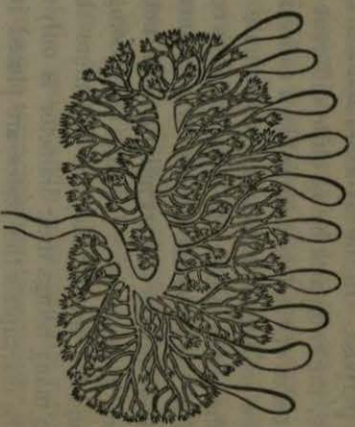


FIGURE 59.—Testicle of *Staphylinus Martiosus*, one of the beetle family, commonly called the cock-tail beetle.

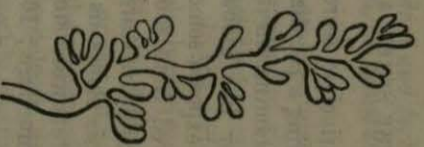


FIGURE 60.—Testicle of *Stiphia Obscura*, the common burying beetle.

In the *Scolopendra maritima*, one of the centipede family, the testes are seven in number, and each one is composed of two parts exactly alike. Each part is hollow, and has a little duct of its own, and these all unite in a common vas deferens, so that there are fourteen pairs of these ducts. The common vas deferens is very long and tortuous, terminating finally near the anus.

In insects the forms of the sexual organs, especially in the male, are often very curious indeed, and no reason can be given, in many cases, for the singularity.

In many insects, besides the testes, there are other glands connected with them, supposed to be *seminal vesicles*, like those of man. Sometimes there are a large number of these vesicles, and they occasionally reach an enormous length, as much



even as twenty times that of the animal's body, which shows what bountiful provision nature has made for propagation in these beings.

The testicles in most fishes are quite large, in proportion to their bulk, and are placed one on each side of the body, similarly to the ovaries in the females. At the time of spawning they become very much enlarged, so as to increase the size of the fish considerably. Some fishes copulate, and have a penis connected with the testes for that purpose. In the ray-fishes and sharks, there are two testicles, and each one is double, the two parts being quite different in structure, and probably in function.

The testes of the frog appear like a collection of simple cells, as they probably are, which are connected with numerous minute tubes which pass into the kidney, and convey the semen into the one tube which is common both to the semen and the urine.

In birds the testes are always two in number, and quite small, but composed of an immense number of very minute tubes, not more, in most cases, than the millionth of an inch in diameter. In many other beings the seminal tubes are also exceedingly small, and the smaller they are the more there are of them, and the longer they are. In many beings their diameter is only some millionths of an inch.

In the marsupials the testes are placed in front of the pelvis, as will be shown farther on.

The testes are of the first importance in the animal economy, especially in man, not only for their use in reproduction, but also from the influence which they exert, when active, upon all the rest of the system. In a subsequent article an account will be given of the principal diseases and derangements to which they are liable.

#### THE SEMEN AND THE SEMINAL ANIMALCULES.

The vivifying principle secreted by the male testes is a yellowish-white semi-fluid substance, having a peculiar odor. It is slightly viscid, and of a saltish savor, when fresh. On examination it is found to consist of two distinct parts, one nearly fluid and the other like globules of half-dissolved starch; but they both melt together when it is exposed some time to the air. The peculiar odor of the semen appears to be derived from some of the parts through which it passes, for when taken from the testes it has scarcely any smell at all.

Chemical analysis shows us that the semen differs but little, in its composition, from other substances found in the body. In 1,000 parts there are about 900 water; 60 animal mucilage; 10 soda; and 30 of phosphate of lime, with a peculiar animal principle, the composition of which is unknown. This analysis it must be recollected is that of the semen as it leaves the body, that is, the secretion of the testes, vesicles, prostate gland, and other parts, united together. How far the pure semen, from the testes alone, differs from this is not known. By some the starchy portion only is supposed to be produced by the testes.

*The Seminal Animalculæ.*—The most curious peculiarity of the semen, and in many respects the most important, is that there always exists in it, when perfect, a number of remarkable living beings, called the *Zoospermes*, or seminal animalculæ. These beings were discovered many years ago, but have not been accurately studied and described till very recently. The representations and descriptions given of them in old works are mostly incorrect, and sometimes very extravagant, and calculated to mislead rather than inform. Some physiologists, who saw them imperfectly, even doubted if they were living beings. The perfection of that magical instrument,

the microscope, however, and the patient investigation of such men as *Pouchet* and his coadjutors have not only corrected these old errors, but have also disclosed to us new truths, more wonderful even than the wild dreams of former times.

As far as yet investigated these animalcules exist universally, in the semen of all animals whatever, but have a peculiar form in each.

It is also ascertained that they are developed from a species of *egg*, or ovum, called the seminal granules, or vesicles. Under the microscope a number of these can always be detected, like little globules of mucus, and they are observed to undergo a regular series of changes similar to those of the female ovary. When first observed they are round, and merely contain a number of small granules, which are the animalcules, in a rudimentary state. At a farther stage these granules are found to be developed into small animalcules, while the containing vesicles have expanded and become elongated, or egg-shaped. Finally, the vesicle breaks open at one end, and the animalcules escape; being at first very small and gradually growing afterwards to the size we ordinarily see them.

In different beings the form both of the vesicle and the animalculæ varies much, and occasionally the zoospermes undergo some remarkable metamorphoses before assuming their final form.

In the human being there are about *thirty* zoospermes in each vesicle, but in some beings there are more, and in others not so many. The number of vesicles varies very much, at different times, even in the same individual.

The precise size of the zoospermes is of course difficult to ascertain, but *M. Pouchet* estimates their *length* at about the *ten thousandth part of the breadth of an ordinary hair*, and their weight at about the *hundred and forty thousand millionth part of a grain!* A spot as large as a mustard-seed, he remarks, sometimes contains *fifty thousand* of them.

Notwithstanding this extreme minuteness, we are now tolerably well acquainted with their peculiarities of structure, and even with many of their *habits*, nor need this excite much surprise when it is recollected that there are beings *still smaller* that have been studied with even greater success. In the perfect state they possess a sucker at the larger end, by which they can attach themselves to any object. They are observed to change their skins at certain periods, like snakes, and we sometimes find the loose skin hanging about them in shreds; or cast off quite whole. In some animals they have a number of hairs, or cilia, by the motion of which they move in the fluid, and some even have perfect fins. One physiologist assures us that he distinctly saw they were sexual, and that he could readily distinguish the male and female! They are usually lively and active, with peculiar motions, some of which are performed in concert and others singly, with great perseverance and regularity; thus, a number of them will sometimes form into a ring, with their heads all one way, and run round and round in a circle for a considerable time; or one may be seen by itself pushing before it a large globule of mucus, or blood, many times heavier than itself, for several minutes together. One peculiarity is observable in all of them, and that is an almost invariable tendency to move only *straight forward*, and they will seldom turn to go back even though they meet with an obstruction, but often attach themselves to it by the sucker and remain till they die. Very often they are seen to enter into combats, and a number of them will fight till only one is left alive. They will live for some hours out of the body, particularly if put in warm water, in which their motions may be readily seen.



The zoospermes are not found before puberty, nor usually in extreme old age. Many diseases also destroy them, and several drugs have the same power. In all cases where they are absent or destroyed, from whatever cause it may be, the semen cannot impregnate, though in every other respect it may be quite perfect, and the vigor of the patient seem not in the least impaired. This has been proved by filtering them away, and by destroying them. The development of the zoospermes, it will be observed, is strictly analogous to that of the ova or eggs in the females. Thus they are first found in the form of little granules, inclosed in a vesicle which bursts as they become more perfect, and allows them to escape. In some animals there is even a periodical development of them, similar to that of the ova in the female, with which it usually corresponds. In such animals the testes are small at other times, and increase in size at these periods, because the vesicles only attain their full growth then.

In tracing the semen from its source, we find that the animalcules are not developed till it reaches the seminal vesicles, and are sometimes not perfect till it has reached the prostate gland. In the testicles we never find the zoospermes themselves, but only the vesicles containing the granules, which gradually develop as the semen proceeds farther on.

The testes may therefore be compared to the ovaries, the seminal vessels to the Graafian vesicles, and the seminal granules to the ova. Some physiologists consider the granules to be the *ova* of the animalcules themselves, but this we cannot yet decide, though it is certain the animalcules originate from them.

The importance of these facts, in giving us a correct knowledge of the nature and proper treatment of many diseases of these organs, will be seen as we proceed, particularly when treating on impotence, and seminal losses.

The actual process of conception is also made more clear from some of these details. For instance, the tendency which the animalcules have to move only *straight forward*, is, in all probability, the reason why they make their way up into the womb from the vagina, and impregnate the egg. If it were not for this tendency, combined with their great motive power, the two principles could not be brought together. Their power of living out of the male organs for some time is also necessary to impregnation, because they may not reach their destination immediately. It is found that they will live in the female organs, when these are healthy, as long as *twenty-six* hours, and of course during any part of that time conception may take place. Sometimes conception may take place in a few minutes, and at other times not till as many hours after the association of the two sexes. It has been found on dissecting an animal killed *ten hours* after connection, that the semen had not then reached the ovum, though it usually passes into the womb almost *immediately*.

It is evident from this how incorrect it is to speak of the *moment of conception*, as if it were a period certainly known. No greater mistake could be made than to suppose that it always corresponds with the moment of *connection*, because it *may* be as much as twenty hours after, or more. It is also evident from these facts why it is that conception is possible *without actual connection*. If the semen is merely deposited in the *external lips* it may impregnate, because the animalcules may make their way from thence up to the womb. It is also of little consequence *how* the semen is deposited in the female organs, providing it be perfect, and this explains why it is that conception can be effected *artificially*, by merely injecting the *semen* in the female organs with a syringe, or otherwise, which has often been done. The

mere presence of the male organ is in no way essential; and this explains why a certain mode of attempting to *prevent* conception often fails. It was also remarked, in a previous part, that sexual *feeling* in the female was not necessary to conception, and this will now be evident when it is recollected that the animalculæ move up into the womb by their own vital power. It is probable, however, that this feeling often *conduces* to conception, by establishing certain favorable conditions of the parts, and therefore that event is not so *likely* to occur during sleep or unconsciousness, though it is *possible* for it to do so.

The old idea that it was only the *odor* or *aura* of the semen that ascended into the female organs and impregnated the ovum, is obviously incorrect, and, indeed, has been fully refuted.

The presence or absence of the zoospermes in the female organs, and other parts, is the chief evidence sought for in cases of alleged violation, because in such cases they may certainly be found alive, if the act has been committed, for as long as twenty-six hours after, and dead for almost any period if the fluids be dried.

It is considered by some that the animalcule is the true rudiment or germ of the future human being, which is supposed to be developed from it in the same way as the plant is developed from the seed; or rather, the human being is thought to be one of these zoospermes developed to a more perfect form by the power of the egg in which it is placed.

It is uncertain in what part the animalcules first issue from their vesicles; nor is it clear how they are influenced by the seminal vesicles and prostate, though it is well known that the semen must pass through those parts before the animalcules become perfect, for in no case will it impregnate when taken from the testes. It is conjectured, in explanation of this, that the vesicles and prostate supply some peculiar food or nutriment, without which the animalcules are never perfect.

There are several drugs that will destroy the animalcules immediately, among which may be mentioned opium, Prussic acid, iodine, and strychnine. The latter article even throws them into *convulsions*, precisely like those seen in human beings.

The most curious effects are produced upon the animalcules by *alcohol*. If only a drop or two be put into the warm water which contains them, they become singularly excited, and dash about as if in a perfect frenzy. Some will whirl rapidly round and round, till they stop all at once, and are found to be dead; others become more than usually pugnacious, and they will fight with such fury, that in a short time all will be slain. Others, again, are evidently thrown into *spasms*, or attach themselves by their suckers, and vibrate the body in the most energetic manner. After a short time these effects pass off, and they become listless and dull. If a larger portion of alcohol be used, they are killed immediately, many of them being first thrown into convulsions. I have good reason for supposing that similar effects are often produced upon them when alcohol is taken internally, in excess, and that many inebriates are thus made impotent. I have frequently examined the semen of impotent patients who were addicted to excessive drinking, and have often found them exhibit precisely the same peculiarities as above described. I feel confident also that the injudicious use of the drugs above mentioned, often produces impotence, by destroying the animalcules; and, indeed, I have proved this by direct experiment upon animals. It is well known that confirmed opium-eaters nearly always become impotent, and that iodine will often cause the testes to waste away, probably by preventing the development of the animalcules. In all proba-



bility many persons are made impotent, or, at least, have their sexual powers much impaired, by these drugs being imprudently given to them while they are children. I have seen many cases in which the ovaries and testes were undeveloped from this cause; and I am inclined to think that the evil exists to a great extent.

In some instances the use of alcohol, and other drugs, does not absolutely destroy the animalcules, but prevents their full development, or makes them imperfect, so that we find them smaller than usual, or deformed. This is especially the case from alcohol and tobacco, as shown by experiments upon animals, and in all probability this explains why persons who use these articles to excess are apt to have stunted, deformed, and diseased children, as it is well known they often do. If the animalcule is, even in part only, the rudiment of the future child, of which there seems little doubt, it is natural to suppose that if it be stunted or deformed, the child will be so likewise, and thus the vices of the father may entail imperfection and disease upon his offspring.

The animalcules are often destroyed by many of the discharges which take place from the female organs during disease, and in this way sterility often results. Electricity kills them immediately, and so will sudden cold, which accounts for some persons being able to prevent conception by using cold water as an injection, immediately after connection.

Before puberty, no animalcules can be discovered, but the vesicles containing them usually begin to appear about eleven or twelve years of age. In old age, the number of them generally becomes less, and very often none at all are found, though the time when they cease to be found is very variable. Some men, though in good health, and robust, become impotent when they are fifty, and others, on the contrary, retain full possession of their powers till over a hundred years of age. In like manner, some children have had the animalcules perfectly developed at ten years of age, and some young men not till they were twenty. I have known those who had no trace of them at twenty years of age, who were, nevertheless, perfect enough at twenty-three; and I once was cognizant of a painful instance in which a young girl of seventeen was impregnated by a boy of *eleven*, she having improperly conducted herself with him without the slightest suspicion of there being any danger in doing so.

It is important to bear in mind that both puberty and decay may be either hastened or postponed, by proper attention to diet and general conduct.

It is a singular circumstance, that though an electrical discharge will destroy the animalcules instantly, yet the continuous galvanic current, even when very strong, has no effect whatever upon them, which shows the impossibility of preventing conception by the use of galvanic instruments, as some have proposed.

Our present comparatively perfect knowledge of the seminal animalcules is important both to physiologists and to the physician, as it enables us both to discover disease, and, in many cases, to suggest a remedy. Formerly, the reason could not be even surmised why certain married persons were childless, though both seemed to be in perfect health, and in the full possession of their sexual powers. It is now known, however, that in many of these cases, though the semen is formed, yet it contains no animalcules; from some cause or other they have not developed, and the vesicles only are found. This condition is more or less natural to some men, and they can, therefore, never become fathers, though fully capable of association. In such cases of sterility, when no obvious imperfection existed, medical men always assumed that

the fault was in the female, it being an axiom that if the male could associate and deposit semen, he could impregnate. This, however, we have shown to be erroneous, because the semen may be *imperfect*, though it be produced. It is wrong, therefore, to suppose, as most people do, that in cases of sterility the fault is most frequently with the female; it is, in fact, fully as often with the male, only the principal cause of it has but just been discovered. Men who are imperfect in this way, are in the same condition as they were before puberty, and are similar to *mules*, many of whom secrete semen, and can associate with the other sex, but having no animalcules, cannot impregnate. In these men the sexual desire is never strong, nor does it last long, and they are always incapable of exciting much ardor in the other sex. This is explained by supposing that the presence of the animalcules is necessary to excite the organs of both, or to develop their peculiar sensibility.

A number of facts have made it probable that the primary rudiments of the animalcules are exceedingly minute, and abundant in the semen, so that a small portion of it may suffice for impregnation for a long time. Thus instances have been known in which both men and animals have impregnated many times though castrated, and for a long time after. Which is explained by supposing that, when the testicles were removed, a quantity of semen must have been left in the vas deferens, vesicles, and prostate gland, which being mixed with the fluids of those parts formed the discharge which impregnated. There must, however, have been a large number of animalcular vesicles in it, and they must have been at first very rudimentary, to continue developing so long. Some physiologists, in fact, suppose that the semen can produce the vesicles spontaneously, and that, consequently, they will always be found in it when perfect, no matter what part of the body it may be taken from.

One of the worst forms of spermatorrhœa, or involuntary seminal loss, that in which it escapes with the urine only, could never be discovered if it were not for the animalcules. In every case of this form of the disease, they can always be detected in the urine, by means of the microscope, and thus the true nature of the trouble can be ascertained beyond a doubt. Before this discovery was made, such a mode of seminal loss was unknown and unsuspected, though it is now known to be more frequent than any other, and, doubtless, thousands have died from it without either them or their medical attendants having the remotest idea what was wrong.

Though the form of the animalcules varies in different animals very much, it is always alike in all individuals of the same species, which is probably the true reason why totally different species cannot, as a general rule, breed together. The outline of the animalcule, as will be seen by the figure of that of the human being, is almost identical with the outline of the main part of the *Nervous System*, the large part representing the brain, and the long extremity, the spinal marrow. It is conjectured, therefore, that the animalcule really constitutes the first rudiment of the nervous matter, while the ovum or egg, as already shown, forms all the other parts. The form of the animalculæ must, therefore, be adapted to the form of the body produced by the egg, and if the two be very much unlike, no union, or impregnation, can take place. I have ascertained, by repeated examinations, that there is a perceptible difference between the animalcule of the negro and that of the white man, sufficient, apparently, to mark a difference in kind, though not sufficient to prevent their fruitful intercourse.

The delineations of the animalcules as given in old works are nearly always false, and sometimes grossly exaggerated. It is, in fact, extremely difficult to make a proper