In the lower animals, the situation of the organs in the two sexes, and the position which they are necessarily compelled to assume during coition, is calculated merely for the perfect accomplishment of the act, and often causes both inconvenience and pain, but in the higher animals other adaptations are found. The position which *they* naturally assume, is not only adapted for the most perfect and convenient performance of the act, but also for causing enjoyment to each. With human beings this is more obvious than with any other, because their capability for enjoyment is greater. With them the position is such as to call forth mutual endearment and admiration, both during the act and previous to it, and also to excite sympathy and tenderness in the more ardent and less sensitive of the two. No other beings, at this time, can see each other's eyes—those windows of the soul, by whose glances ardor can be aroused and excitement subdued—nor those expressive lineaments of the face, which can call forth pity and forbearance when timidity conquers love. In many cases of attempted violation, the vision of the victim's face, full of intercession and reproach, and compelling deference and admiration, has overcome the fury of amorous lust, and driven the would-be ravisher away in spite of himself. Even in lawful marriage, sanctioned by love and reason both, this circumstance, though it may seem of little moment, prevents many injuries and evils which the peculiar and delicate organization of woman would otherwise subject her to. In fact, there is as much *design* and admirable contrivance exhibited in this particular, as there is in any action connected with the human frame, and with rational beings it is equally worthy of attention. It is also equally proper to be understood, and its study is eminently calculated to subdue those gross and merely animal feelings with which alone everything of the kind is usually approached.

Before this process can be fully understood, however, it will be necessary to describe all the organs employed, in both sexes, more especially in the human being, as these may be considered the most complete, and all the others as deviations from them.

PART IX.

THE ORGANS OF GENERATION IN BOTH SEXES, AND IN THE DIFFERENT TYPES OF ANIMALS.

CHAPTER XXI.

THE ORGANS OF GENERATION IN OVIPAROUS ANIMALS.

In oviparous animals, who only produce eggs, to be developed out of the body, no sexual organs are needed but those which form the semen and the ovæ, and the copulative organs, which are used to bring them together. In viviparous animals, which bring forth their young alive, there is needed, in addition to these, a special set of organs by which the new being is connected with the mother during its growth, and by which it is nourished at her expense.

The oviparous sexual organs are, therefore, the most simple, and will be described first.

The most important of these, the female ovaries and the male testes, have been already fully explained, and it only remains to describe the other organs which serve to bring their products together, or, in other words, to effect impregnation.

In those that impregnate the eggs externally, of course no copulative organs are needed, as in most fishes and frogs, for instance. The female merely expels her eggs and leaves them in the water. The male does the same with his sperm, and the two thus come together without any concurrence of the two parents whatever. In these beings, therefore, sexual generation is reduced to its simplest elements, and but few organs are needed ; still, there are fishes even that must copulate, because the eggs are found hatched inside the female's body, but the precise way in which the act takes place has not been ascertained. In some of these, however, the male possesses a long conical penis, covered with scales, inside which is a canal leading from the testicles, and down which the semen is conveyed. With this organ, no doubt, copulation is effected as in other animals.

Some of the rays have a penis more or less developed, and they couple together, belly to belly, the male being provided with an extra apparatus for holding the female close to him during the act.

These, however, are exceptions, and in the great majority of fishes there is no copulative union of the sexes.

Frogs, as before stated, do not copulate, but the male fastens his limbs around the female at the time when the eggs are ripe, and squeezes her body to such a degree that it would seem impossible for her to live. This is done, apparently, to force out the eggs, which he waters with his semen as they escape. This is a kind of coupling, but not copulation, because the actual impregnation occurs outside the female's body. The common name given to the male frog of *midwife*, or *accoucheur*, is therefore well deserved, because he assists the female to bring forth her eggs.

The contraction of the limbs of the male frog, in this act, is probably spasmodic, and involuntary, for it is not possible, except with extreme violence, to make him loose. In fact the limbs may often be torn off in trying to detach him. When there happens to be but few females, so many males will cling around one that they not only stifle her, but many of the males themselves perish, and bunches of them

may be found with a number of those in the interior dead and putrefying. The males will even thus cling to one another, when there is no female near, or to fish, on which they will fasten in the same way, till they weigh them down. It is quite possible that this act is as pleasurable to the frog as complete copulation is to other beings.

The common frog leaves its eggs, after impregnation, in the water, where they may be seen, in the early spring, in large masses, like jelly, filled with little black specks, which are the future tadpoles. In some kinds, the eggs, after they are impregnated, are glued to the animal's back, and are carried about till they develop into tadpoles, when they drop off.

There are some animals among whom the male takes charge of the eggs after they have been impregnated, and guards them till they have hatched. In Chili there is a species of frog, the male of which has a pouch or pocket on the under side of his body, in which the female's eggs are developed. How they are conveyed there, and how they are first impregnated, we do not know.

The male crab has two penises, one on each side of the thorax, behind the fifth pair of claws. They are horny, pointed, and tubular, and connected with the testicles by long twisted tubes, down which the semen is conveyed to them at the time of copulation.

The female has two corresponding openings, in the same situation, to receive the two male organs, and when they couple, she throws herself on her back, so that they lie belly to belly, and hold to each other by their claws. The male semen is poured into the two female openings, which are connected by means of the oviducts with the ovary, and through them reaches the eggs, which it fecundates.

The eggs are laid some two months after copulation, and are attached in a very curious manner under the female's tail, and she carries them about with her till they hatch into little crabs. These keep near the mother and hide under her when there is danger, till they are considerably grown.

A similar arrangement is observed in the lobsters.

The generative organs in *ants* are contained in one of the segments of the abdomen, but their structure and manner of action is not well understood. The habits of the animals, however, at the breeding season, have been well observed, and are very curious. It is well known that they live in societies, like bees, and display remarkable intelligence and foresight in what they do for their common welfare.

There are three classes of them, males, females, and neuters, called *drones* among the bees, which do pretty much all the work of the community. Not being concerned at all in reproduction, they are devoted to labor and to fighting, which leaves the males and females free to attend to propagation and rearing the young.

The males are born with wings, like the females, but are usually kept close prisoners till they are needed for the purpose of impregnation. When that time arrives all the inhabitants of the ant-hill turn out together, a crowd of neuters surround the males and take them to a place which seems to have been selected beforehand, where they meet the females, and copulation immediately takes place. Very soon after the act is accomplished the males die, being no longer needed, and the females are conducted back to the ant-hill, where their wings are torn off, and they are then taken into the most secluded chambers of the hill. All this is done by the neuters, who take the pregnant females under their care, and attend to them most assiduously, feeding them and carrying them about, and caressing them in many ways.

The abdomen of the female swells enormously as the eggs ripen, and when they are fully developed they are laid like those of a bird. This operation, however, is assisted by one of the other ants, who fastens on to the mother, seizes hold of the eggs as they are expelled, one by one, and arranges them in a heap; afterward these heaps are all taken by the neuters, and the eggs deposited in places prepared for them, when they develop into the larvæ of the future brood.

The bees act similarly, in many respects, to the ants, and they always impregnate but one female, who produces all the eggs for the next swarm. These animals will take any young larva and develop it into a male, a female, or a neuter, according as they treat it. If they lose their queen they immediately take one of the common young, and by feeding it in a particular way develop it into a new queen. This fact, along with several others, shows that sex is entirely a matter of development, both being the same fundamentally.

When only one female in a community breeds, the organs of the other females remain undeveloped, but any one of them can be perfected if required, by appropriate feeding and attention. Some of the ants impregnate but one female, who produces eggs enough for the most numerous swarm.

FIGURE 61.—*Male Organs of Buccinum, or Water Snail.*

b are the testes. *d* is the penis. *c* shows the interior of the penis laid open. The convoluted tube is the spermatic duct leading from the testicle. *a* is the tail. The penis is never retracted within the body completely, and is frequently extended without apparent object.

Among spiders sexual association is an act of extreme danger to the male, who often loses his life in attempting it. The female places herself in the center of her web, and there awaits her lover, who approaches with extreme caution, and tries in many ways to find out if his visit is acceptable. He shakes the threads of the web, creeps slowly up and touches her with his claw, retreating quickly back again, and this is done repeatedly, till finally if she remains quiet he springs upon her, embracing her with his front limbs round the abdomen, and the act is accomplished. If his visit is unacceptable, the female often springs upon him during one of his attempts, stings him, and he dies. She will then tear him to pieces.

The short hand-like claws or feelers, which are placed one on each side of the mouth, in the male spider, are supposed to be the organs with which he excites the female, but the actual process is not known. There is no organ analogous to the penis.

In several of the mollusks, or shell-fish, resembling the water-snail family, there is probably a real copulation, for the male possesses a muscular penis, of enormous size, in proportion to the body, and which is capable of being protruded when required for use. It is placed on the right side of the neck. The testes also, which communicate with the penis, are very large.

In the female the ovaries correspond in position with the male testes, and they are connected with a long and tortuous oviduct. In what way the male penis is used we do not know.

The above plate shows one of these animals.

In all the more perfect oviparous animals the eggs are impregnated within

PLATE XI.

GENERATIVE ORGANS OF A BIRD.

Figure 1. The female bird opened to show the connection between the generative and other organs. *aa*. The liver, which laps round the heart. *b*. The stomach, from which proceeds *cc*, the intestines. *d*. The cloaca, or large intestine. *e*. The heart. *f*. The beginning of the oviduct, or egg passage. *gg*. The oviduct. *h*. The ovary.

Figure 2. The generative organs taken out, but still in the same position. The letters up to *h* indicate the same parts as in Figure 1. *ii* are two little intestines nearly always found in birds; uses unknown, they join the cloaca, as seen. *jj* are the ureters, which bring the urine into the lower part of the large intestine. *k*. The enlarged part of the lower end of the large intestine, called the *cloaca*, into which passes the urine, the excrement from the intestines, and also the egg. It is the chamber common to them all. *l*. The rudimentary bladder. *m*. The orifice of the anus.

Figure 3. The same organs open, with the same letters to the same parts. *n* shows the mouths of the ureters opening into the cloaca. *o*. The passage leading outward of the cloaca. *p*. Opening from the bladder. *q*. Opening from the oviduct, through which the egg passes into the cloaca.

Figure 4. Organ of the male bird. In the male, of course, there is no ovary nor oviduct, but in place of them are found other organs, which are here shown. *a*. The lower end of the large intestine. *b*. The enlarged portion opened. *cc*. Openings of the ureters. *dd*. Openings of the ejaculatory tubes, leading from the testicles, down which the semen is conveyed. *e*. The ring surrounding the anus. *ff*. The testicles, which are placed one on each side of the back, just beyond the tail, and immediately under the skin. *gg*. The spermatic tubes which convey the semen from the testicles. *hh*. The ureters, which convey the urine. *ii*. The muscles which close the anus. *jj*. The muscles which open the anus.

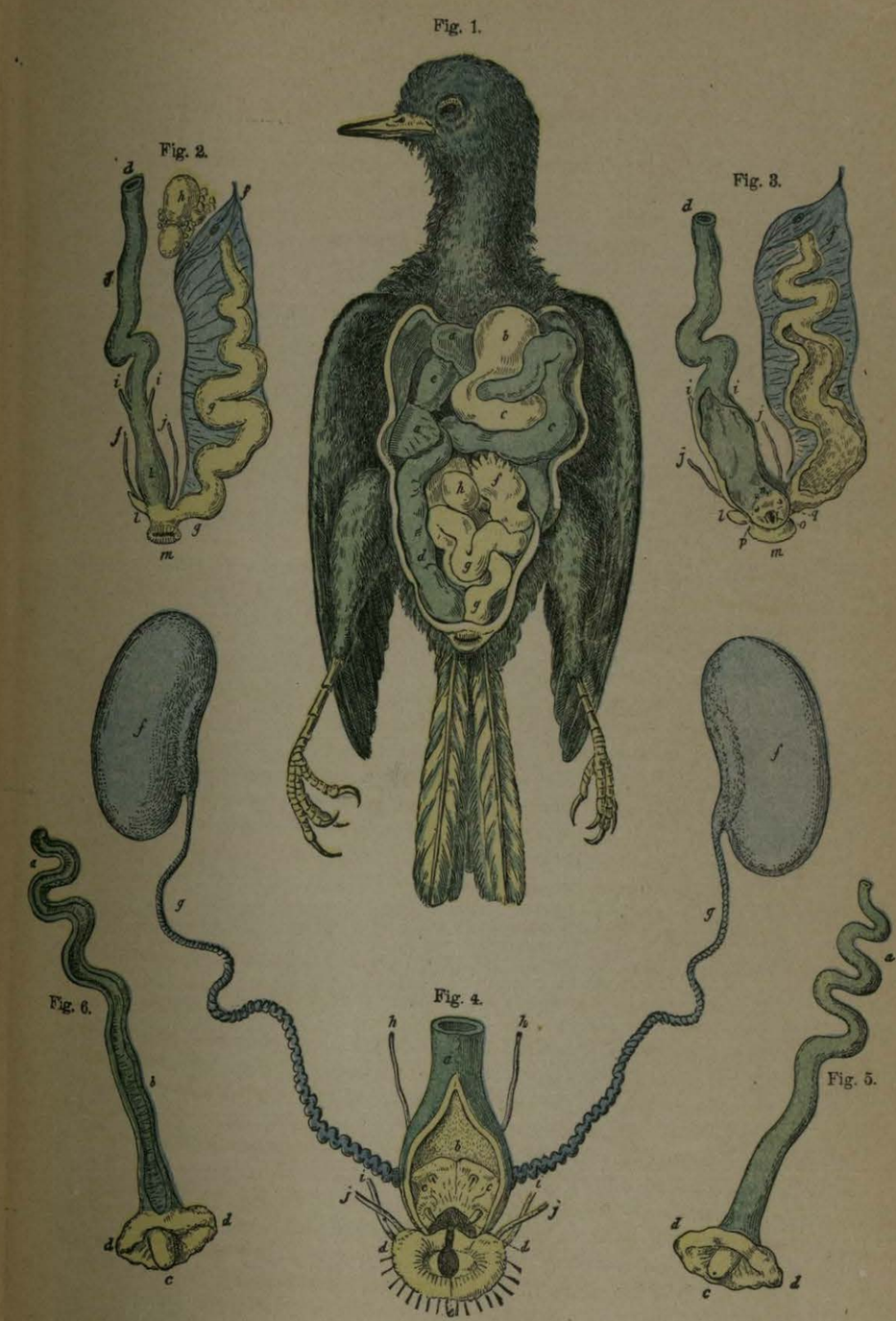
Figure 5. One of the spermatic tubes enlarged, showing the projecting opening at *c*.

Figure 6. The same portion opened to show the interior.

The action of the organs in both male and female will be readily seen from this Plate. In the female, the eggs are formed in the ovary, *h*, Fig. 2, and are passed one by one as they ripen into the oviduct, through the little opening seen at *f*, and are conveyed by the oviduct down to the cloaca, or enlarged lower end of the large intestine, into which they pass through the little opening at *q*, Fig. 3. From there they are expelled outward through the anus, *m*, Fig. 2.

In the male the semen is formed in the testicles, *ff*, Fig. 4, and from there is conveyed by the spermatic tubes, *gg*, to the cloaca, which it enters through the little openings seen at *dd*, Fig. 4. It will be seen by Figs. 5 and 6 that the end of the spermatic tube projects, like a nipple, into the cloaca.

PLATE XI.



Generative Organs of a Bird.

the female's body by a more or less perfect act of copulation, and are then expelled to be hatched externally. In some cases, however, as in the ovoviviparous, they are occasionally hatched before leaving the body, but the young are in no way connected with the mother.

A few illustrations of the copulative organs in different types of animals will now be given, and the way in which they act explained.

The *bird* will be the first explained, because it is an animal with which all are familiar, and one which can easily be made the subject of corroborative observation and experiment.

There are two ovaries in the female, but only the left one is developed, the right one being rudimentary, or undeveloped.

It will be seen that the male has no penis, so that internal copulation between the two sexes cannot occur. The act that takes place, however, serves the same purpose, and no doubt affords the same gratification as the more perfect act in other animals. At the time of association the two birds so place themselves that the mouth of the anus in the male is pressed firmly against the same part in the female, the semen is then emitted, and passes into the cloaca of the female, from whence it reaches the ovæ, by the oviduct.

During the association the external opening of the anus, in both animals, swells out and opens, with considerable energy. In fact it is analogous to *erection* in other animals.

The act of connection in the common fowl is repeated frequently, as is well known, but probably only a small amount of semen is expelled each time. One connection, it used to be thought, impregnated only one egg, but this is a mistake, for it is well known that one act will impregnate several that are laid afterward. If, however, the male does not continue to associate the eggs finally become barren, though they continue to be laid, and apparently are as perfect as before.

Although this is the usual arrangement in birds, still there are some curious exceptions. Thus the *ostrich* has quite a large and well-developed penis, conical in form, and with a deep and narrow furrow down the back, which conveys the semen into the female organ. The spermatic tubes open into the cloaca at the root of this penis, so that the semen passes at once down the furrow, when the organ is in use.

The peculiarity of this penis is that it never softens, but is always firm and hard, so that there is a constant state of erection, or readiness; when not in use it is bent back, drawn into the cloaca, and passes into a kind of bag, or pocket, where it remains till again required to be protruded. When so drawn back it closes up completely the mouth of the urine tube, and indeed of the whole cloaca, so that whenever the animal requires to urinate, or to void his excrement, he has to protrude the penis the same as when he connects with the female. This is a very singular arrangement, and occurs in no other bird, so far as I know; of course the male and female ostrich copulate perfectly, the same as the higher animals, the male penis being used in the same way as with them.

Among the swimming birds, the ducks, geese, and swans, also have a penis, but different from that of the ostrich. It is composed of two tubes, one within the other, the outer one thin, and wrinkled up, like a spring, and the inner one much thicker. At the time of erection the outer tube unfolds itself like the finger of a glove, and the inner one introduces itself in the interior, making the whole organ quite firm. At other times both are drawn back into a kind of pocket in the cloaca,

PLATE XII.

GENERATIVE ORGANS OF A SERPENT.

The eggs will be seen between *p* and *q*, about two-thirds of the length from the head, strung together like the beads of a necklace; they pass down the oviduct *p* as they ripen, and are discharged into the cloaca at *x*, where they are impregnated at the time of copulation; *s*, the opening of the ureters; *l l*, the liver; *h*, the heart; *k*, the right lung.

Fig. 2. *a a*, the male generative organs, or double penis, with fingers.

Fig. 2 *a*. *b c*, scales which cover the opening of the anus, where the penis is protruded.

At the time of copulation the male and female twine around each other very tightly, and the embrace lasts a long time. The penis is double, and the finger-like protuberances being bent back during connection, they serve like hooks to hold the female fast.

The testicles are like a tangle of fine threads, placed near the kidneys *q*, and being very long, the semen is emitted slowly, which necessitates the long copulation.

PLATE XIII.

GENERATIVE ORGANS OF CRUSTACEANS.

Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, represent the common barnacle (Cirripede) in different ways.

Fig. 1. The animal removed from its shell; *f f*, the cirri, or limbs; *u*, the spermatic tube, or male organ.

Fig. 2. The animal seen sideways; *u*, the spermatic tube, which receives the semen from the granular testicles above, lying each side of the intestinal tube; the sperm is emitted from the end of this tube on to the eggs in the mantle, at the proper season, both being contained in the same animal.

Figs. 4, 5, 6, 7. The testicles or seminal vesicles enlarged.

Figs. 8, 9. The same animal in its shell.

Fig. 8. *f*, the cirri; *g*, the ovaria; the female organs, with the eggs.

Fig. 9. *b b*, the tube containing the eggs laid open, and from which they are conveyed to the mantle *g*.

The barnacle is, therefore, perfectly hermaphrodite, the male sperm and female eggs being in the same animal.

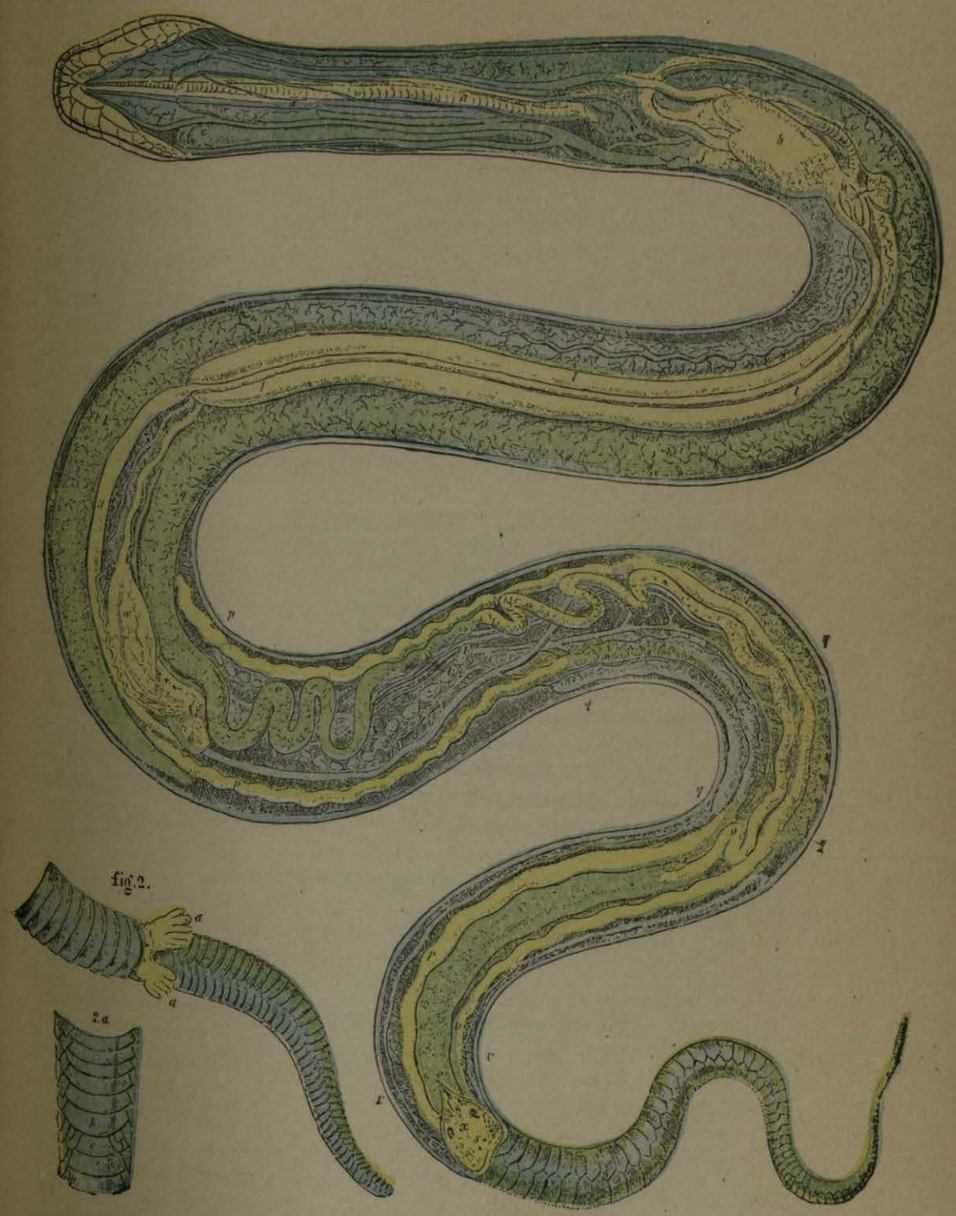
Fig. 10. A snail dissected; *u*, the liver; *v*, the ovary; *x*, the oviduct; *y*, part of the testicle; *z*, the bladder.

Fig. 11. Snail deprived of its shell; *a*, the large horns; *b*, the small ones.

Fig. 12. The genital organs of the snail removed, as shown elsewhere; *n*, the penis; *f*, *g*, *h*, the testicles and ovary; *u*, the common generative cavity; *s*, the love-dart; *i*, the spermatic tube; *o*, the bladder; *c*, the multifid vesicles; *k*, the place where the semen enters the urethra.

The other parts not being concerned in generation are not here referred to, and the generative organs of the snail are more fully described in another place.

PLATE XII.



Generative Organs of a Serpent.

PLATE XIII.

Generative Organs of Crustaceans.

but they make no interference with the passage of the urine or excrement, as the always firm organ of the ostrich does. These birds, of course, copulate fully, usually in the water, and the act is more prolonged than with flying birds, some of whom copulate in the air.

In some birds the lower part of the spermatic tube is enlarged into a kind of sac or vesicle, and is always full of semen. The action of the muscles around the anus, at the time of connection, squeezes this sac, and forces out some of the semen into the cloaca.

Why connection should be so incessant with some birds we do not know. It certainly occurs much oftener than is necessary for fecundation, and apparently serves no actual need. Possibly it may be, for the most part, a mere gratification. The excessive secretion of semen may be compared to the superabundant production of pollen in plants, which is certainly far beyond what is needed for fertilization alone.

The egg in the bird, it should be remarked, when it first passes from the ovary into the oviduct, is but little more than a ball of yelk. The white and the shell are added to it during its slow passage down the oviduct.

We will next describe the organs in *reptiles*, from whom birds are descended, as comparative anatomy and fossil remains conclusively show. The scales of the reptile are modified into feathers, and its upper limbs into wings, while other parts are changed in various ways, but all can be fully traced and connected.

Frogs, as before explained, do not copulate, but fastened on the female's back they watch for the eggs, and shed the semen on them as they come out. At the time of fecundation a peculiar growth of small protuberances, like warts, appears on the skin of the belly and under-sides of the feet of the male frog, which he squeezes into the skin of the female, like pegs, to enable him to hold on firmly, without slipping. He will wait fastened on his companion this way, with his limbs tight around her, for six weeks or more, till the eggs are laid. At the commencement of this singular coupling the female is much swollen, by the contained eggs, but as fast as they are expelled she begins to reduce in size, till at last she becomes quite small, and then the male releases his hold and they separate. They are then both much reduced in flesh, and very weak, but soon regain their usual condition.

The tortoise has a well-formed penis, proportionate to the size of the animal, with a deep furrow along the back, as in that of the ostrich. When not erect it is also drawn back into the cloaca, as in that bird, and prevents the outflow of urine, or excrement, in the same way, till it is protruded.

The males of these animals are less than the females, and ordinarily are very dull and sluggish, but in the breeding season they become unusually active, and fight fiercely for the favors of the female. The great aim in their struggle, seems to be to throw one another on the back, because when one is so placed it takes him a long time to right himself, and in the meanwhile his successful rival has secured the female.

This circumstance, of finding them so often on their backs, led to the opinion that they copulated that way, belly to belly, but this is not the case, for the male seizes the female from behind and places himself on her back, as I have often seen. The penis is then protruded and bent under, the tail of the female being turned sideways, and the anus expanded, to facilitate its entrance into the cloaca.

The embrace usually lasts a considerable time, and one copulation will fecundate