1856

Obstetrics: The Science and the Art - Part I. Anatomy of the Parts Concerned In Reproduction; Chapter V. The Ovaries

CHAPTER V.

THE OVARIES.

THE ovaries are organs for the preparation of ova, or eggs which contain the germ of the offspring.

In the mammals, there are two ovaries, within each of which may be seen, with a good lens, from twelve to fifteen eggs, or yelks, inclosed within their proper capsules or ovisacs, which are commonly called Graafian follicles, or ovarian follicles. They were some time since denominated Graafian ova—because De Graaf imagined that these pellucid bullæ were the ova of the animals in which they were seen by him. Let the Student early make the discrimination between the follicle, the cell, or ovisac which contains the egg, and the minute egg itself, which is too small to be readily seen by the naked eye.

The human ovary is about an inch in length, half an inch in depth, and more than a quarter of an inch thick; in shape, it is like a flattened olive.

Each ovary is attached to an angle of the womb—one on the right, and the other on the left. It is connected with the uterus by a short footstalk of a fibrous structure, which is called the ligament of the ovary.

The ovaries lie behind the Fallopian tubes, inclosed in a duplicature of the peritoneum, that adheres firmly to the proper covering or coat of the organ; so that the ovary is invested by a serous membrane or indusium, as the liver, stomach, or intestines are.

Underneath the serous covering lies the strong white fibrous coat, or tunica albuginea, which is a closed sac containing the stroma, the peculiar tissue of the organ. There is thus no proper excretory duct for this organ; nevertheless, the Fallopian tube becomes, upon occasions, the vector of its product. The connection of the vector tube with the organ exists, in all probability, only during the few moments of the sexual excitement, or orgasm. In the embryo, however, as late as the sixth month, the end of the Fallopian tube is permanently attached to the ovarium—before the seventh month, the connection is

broken. (See Rosenmuller, *Quædam de Ovariis Embryonum et Fœtuum Humanorum*, p. 11.)

I have a specimen of fœtus at the sixth month, in which the detachment has not taken place.

The stroma of the ovary, with which the closed sac of the albuginea is filled, is a peculiar concrete, consisting, apparently, of a rather dense cellular tela, of a salmon color. Throughout the stroma are to be seen numerous delicate arterioles and venules, that are the distal branches of the ovaric artery. It is worthy of observation, that the blood of this circulation is brought from a great distance, since the ovaric artery arises for one side from the emulgent, and for the other from the aorta itself. As the ovaries, like the testicles in the male, are originally formed high up in the abdomen, near the kidneys, an economical purpose was answered by deriving their circulation from these sources. Whether there be any further and peculiar economical end to be attained by drawing this blood from such a distant point, remains unexplained.

If the tunica albuginea of an ovary be divided with a scalpel, the stroma may then be readily torn asunder by pulling the edges of the incision apart with the fingers.

The ovary of a mammal, when examined for the purpose, exhibits several watery vesicles, whose translucency renders them visible through the indusia or coats of the organ. By cutting the ovary open, and carefully dissecting them out, these vesicles or bullæ may be completely freed from all attachment, when they appear as globules filled with water, and of sizes varying from the bigness of a garden pea to that of a small bird-shot. In each ovary may be counted some fifteen of these vesicles.

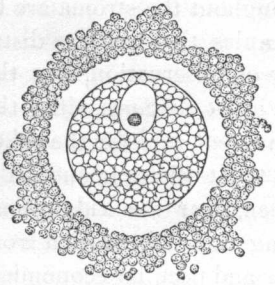
These Graafian vesicles—for so they are usually denominated—are also called Graafian follicles, Graafian cells, Graafian ova, and ovarian follicles. They are ovisacs. They are composed of a double membrane, one inside of the other. The outer or largest one, is united to the smaller or inner one, by a very delicate cellular bond, or magma, which, if infiltrated, serves to compress and crush the inner, while it distends and expands the outer coat or sac. Hence, if the outer sac should thus be greatly enlarged, the inner one would at the same time be crimped or corrugated, so as to give to the inner surface a convoluted appearance.

If a Graafian vesicle be punctured with a lancet, there spirts out, through the cut, a drop of water. This drop of water, when collected on a glass or knife-blade, and placed under the microscope, is found to consist of a pellucid liquor, in which swim a great number of small

grains. Among these grains there is a portion or acervulus, in which the grains are agglomerated in greater number, and, in the midst of these, a yelk-ball is found.

Fig. 40 represents this yelk-ball, bounded by a white, transparent zone, which is called its zona pellucida. It is a perfect sphere, filled with vitellary corpuscles, oil globules, and puncta that swim in a transparent liquor. The sphere or yelk-ball lies amidst the cumulus of granules before mentioned, as may be seen in the figure, taken from Rudolph Wagner's *Prodromus*.

Fig. 40.



It is outside of, or beyond the white zone or zona pellucida, that are to be seen the smaller granules of the cumulus or acervulus, so that the globular ovum above represented is bounded by the transparent or white zone. These outside granules are some remains of the granular membrane that lines the inner concentric membrane of the Graafian follicle.

Perhaps the physiologists go too far in calling it a granular membrane. It consists of innumerable grains that settle themselves, touching each other, upon the inner wall of the vesicle, like sediment in a vial. I do not deny that they deposit themselves thus under the forces of a vital affinity, and it is even probable that they do so; but whenever the vesicle is punctured, this so-called membrane becomes decomposed, and floats out as loose grains along with the yelk-ball; great multitudes of them adhering to it; many being entirely disconnected, while some of them stick together in laminæ, or clusters, or acervuli.

This granular membrane, or tunica granulosa, is thickest, in general, at that segment of the Graafian vesicle which is nearest the surface of the albuginea, and there it forms a small heap—an acervulus or cumulus, which has been by Baer called the cumulus proligerus or discus proligerus. It is in the apex of this cumulus or cone that the egg is found, and it is generally among the debris of this acervulus that the microscope reveals the yelk, with its bright pellucid zone.

Upon referring again to the above figure, the Student will see that in the yelk-ball, amidst its vitellary corpuscles, there is pictured a clear, transparent, oval vesicle, with a dark spot upon it. This is the germinal vesicle, sometimes called Purkinjean vesicle, and the dark spot is the germinal spot, or maculæ germinativæ of Rudolph Wagner, which M. Coste calls the *tache embryonaire*.

Such, in general terms, is the human ovary, which, I repeat, consists of a closed sac, filled with ovarian stroma, in which are developed ova within ovisacs usually called Graafian follicles. These ova are true yelks, about one-fifteenth of a line in diameter. In each unfecundated yelk is a germinal vesicle one-sixtieth of a Paris line in diameter, and having upon its inner surface a germinal spot consisting of dark granules—the germinal spot being one-two-hundredth or one-three-hundredth of a line in diameter.

I have many times observed the numerous granules, or dark puncta, that may be inspected by placing thin slices of ovary on the field of a microscope. There are immense numbers of these points, which are, by some, supposed to be nuclei, or cytoblasts—the inchoate elements of ovarian ova. Such is the opinion of Martin Barry, who gives, in his papers, published in the *London Phil. Trans.*, drawings of these appearances in the ova of various animals. Gerber's anatomy also contains a plate representing this microscopic view.

If this notion be indeed founded in truth, then each ovary should be held to contain, not fifteen ova only, but the nuclei of hundreds of thousands of them.

Perhaps, however, the microscopic view is not correct, and these points are acini of the gland, if the ovary is a gland. Supposing them to be acini, and that an acinus may, by some physiological act, be cast off from its connection with the stroma that produced it, and carry away with it, like an inoculated bud or like a spore, or a pollen grain, the metabolic and the plastic forces—by which to develop the ovarian ovule—still we have, in either case, the idea of a reproductiveness in creatures beyond imagination for copiousness.

The ovaries are abundantly supplied with nerves derived (*Longet*, t. ii. 543) from three or four branches that come off from the renal plexus, and proceed, in company with the ovaric artery, to the place of distribution. They are called the ovaric plexus, and distribute their terminal fibrils within the ovary, and in part, also, upon the uterus, thus connecting the two organs in a common bond of sympathies.

Regner de Graaf, of Delft, in Holland, where he died at the age of thirty-two years, on the 17th of August, 1673, published his work *De Mulierum Organis Generationi Inservientibus* in 1672, and gave, as I have said, his name to the ovarian vesicles, or ovi-capsules. They were by him considered to be ova, and were long, and even until lately, by many, regarded as ova; for no one, until recently, had acquired any correct notions of the ovum of the mammifera.

At p. 181, he says: "In cuniculis autem, leporibus, canibus, porcis, ovibus, vaccis et reliquis animalibus à nobis dissectis, ea vesicularum

ad instar, ut in avibus ovorum germina solent, sese dissecantium oculis exhibent; quæ in Testiculorum superficie existentia, communem tunicam hinc inde sublevant, atque ita per eam aliquando transparent ac si brevi exitum minarentur." His 15th plate represents the follicles as "ova." They are not ova, but merely ovisacs.

It is a title to immortality in the Republic of Letters, to have discovered the ovum of the mammal, and there has been a great contention as to the priority in this claim. It appears to me that, although one person may have first seen the object, so many individuals have been concerned in establishing and explaining the natural history and physiology of the fact, by laborious researches and patient efforts of reason, that no single person should be deemed entitled to all the credit: and it is certain, that the world is too much indebted to divers persons on this account, not to be willing to divide the honors of the career among many claimants. I feel no inclination to enter in favor of any particular person the lists of this controversy, in which I have no other than a common interest of gratitude to all the ingenious philosophers who have in this illumined my therapeutical path with floods of radiant light, freeing me from the errors and gropings of my blind predecessors, and enabling me clearly to perceive, and plainly understand many mysteries of physiology and therapeutics that were utterly hid from their eyes.

But the Student of medicine ought to be somewhat acquainted with the literary history of the subject, lest he wander, and be wholly lost among authorities that have now ceased to have any claim to his obedience. Let him, therefore, understand that a meeting was held at Breslau, in Silesia, in the year 1825, in honor of the fiftieth year of the Doctorate of Professor Blumenbach. At that meeting was presented a volume under the following title: *Joan. Fried. Blumenbachio, etc. Summorum in Medicina honorum semisæcularia gratulatur ordo medicorum Vratislaventium, interprete Joanne Ev. Purkinje. P. P. O. Subjectæ sunt symbolæ ad ovi avium historiam ante incubationem: cum doubus lithographis. Vratislaviæ, Typis Universitatis.* This volume was printed in September, 1825, but was not published, being designed only for private distribution. An edition of it was afterwards published for sale at Leipsic, in 1830, 4to., of which a copy is now before me. I look upon Professor Purkinje's book as the first in the series of the works of reform as to our knowledge of the ovaria. This is the work in which was first made known the existence of the germinal vesicle, commonly called the Purkinjean vesicle of the bird's egg.

Professor Purkinje had interested himself in the investigation of the cicatricula, or tread of the hen's egg. He was examining it in a

vessel of water in order to learn the nature of the cumulus that lies directly underneath the cicatricula, and of which Fig. 41 is a repre-

Fig. 41.

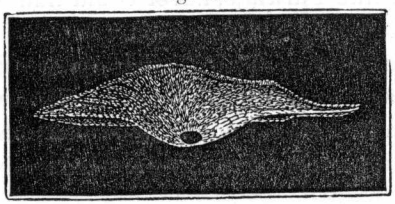
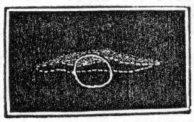


Fig. 42.

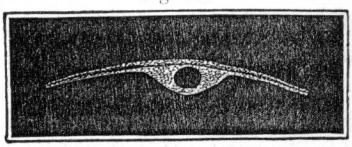


sentation. It has been very beautifully produced on wood by Mr. Gihon, from the original lithograph.

While, with a pair of dissecting needles, tearing the yelk asunder under water, and removing the broken-down masses with a pipette, he came upon a "most beautiful vesicle," partly adhering to the margin of the pore in the apex of the cumulus, and partly detached from its bed therein. His own words are: "Hæc dum lente ope perlustro, vesicula formosissima parte margini pori adhærens, parte libera haud parum mirabundo mihi offertur." Fig. 42 exhibits this appearance.

The cavity in which this Purkinjean, or germinal vesicle (the first that was ever seen), is contained, is represented by Purkinje as in the annexed cut, Fig. 43, also copied from his lithograph. It is a cross section of a portion of the yelk-ball and the cumulus, with its cavity, in the hollow of which was found the Purkinjean vesicle. The transparent vesicle thus revealed is almost as delicate in its structure as a soap bubble. It can be found only in eggs that have not been fecundated, such as the pullet's egg, or yelks taken out of the ovary, in which, according to Von Baer, it exists, even in the very smallest yelks. Fecundation abolishes it.

Fig. 43.



The Student has now a clear understanding as to the germinal or Purkinjean vesicle, discovered and made known in September, 1825. This Purkinjean vesicle is the germinal vesicle that is found inside of the unfecundated yelk, whether of birds or women or other animals.

The next publication in the order of important discovery, was the *De ovi Mammalium et Hominis Genesi. Epistolam ad Academiam Imperialem scientiarum Petropolitanam, dedit Carolus Ernestus A. Baer. Zoologiæ Prof. Publ. ord. Regiomontanus, cum Tabula Aenea.* Lips. 1827, 4to.

Such is the title of Von Baer's letter to the Imperial Academy of Sciences at St. Petersburg, on the subject of the ovum of the mammiferous quadrupeds.

In Von Baer's experiments, he, like Purkinje, never could find the vesicle in eggs already laid, but always detected it in even the smallest yelks of the egg bag. He supposes it to be the nucleus around which the matter of the yelk becomes subsequently aggregated. This was the case also in the molluscs, in the lumbricus and in the leech. These researches led him to the discovery of the mammiferous ovulum, in the following manner.

Having observed a very minute ovulum in the Fallopian tube of the bitch, and reflecting that such *small* ova could not consist of Graafian vesicles, which are much larger, and that the liquor of the Graafian vesicle could not so soon acquire the firmness and solidity of the tubal specimen, he was led by curiosity, rather than by the hope of seeing with the naked eye, through the several coats of the Graafian vesicles any ovula in the ovaries, to open one of the follicles with his scalpel, and placing the fluid that came forth upon the platine of his microscope: "Obstupui," says he, "profecto, cum ovulum ex tubis jam cognitum, tam clare viderem, ut cœcus vix negaret. Mirum sane et inexpectatum, rem tam pertinacitur quæsitam, ad nauseam usque in quocunque compendio physiologico uti inextricabilem tractatum, tam facillimo negotio ante oculos poni posse." P. 12. He informs us that this ovulum may, in some specimens of the ovary, be seen through the coats of the ovi-capsule.

Everybody seems willing to concede to Von Baer the honor of this discovery, which was effected two years later than that of Purkinje, viz., in 1827. But, notwithstanding his good fortune as the discoverer, he is not the true expositor of its nature, for he mistook the ovulum or yelk for the Purkinjean vesicle, and he says: "Demonstrabo enim mammalium ova vesiculis Purkinji reliquorum animalium comparandas esse, quas in animalibus nonnullis, molluscis, acepalis v. c. et lumbricis ovorum evolutionem antecedere clare me vidisse puto;" that is to say, "he will show that the mammal ovum is to be compared with the Purkinjean vesicle in other animals, and that the evolution of it precedes that of the ova in certain molluscous creatures, as he supposes to be verified by his observations."

At p. 32, he argues the identity of the nature of the Graafian ova and the ova of birds and spiders, which have a great quantity of vitelline corpuscles and but little liquid, while the Graafian ova bear but few corpuscles and much albuminous fluid. "Besides, they resemble eggs in possessing a vesicle situated in a cumulus, and

surrounded with a proligerous layer. *Therefore*, a Graafian vesicle, in view of the ovary, and in general, of the maternal constitution, is the true ovum of the mammal. 'Vesicula ergo Graafiana cum ad ovarium generatimque ad corpus maternum respiciamus, ovum sane est mammalium.'" Von Baer, notwithstanding the tyranny of the schools, almost saw the real truth; for he remarks upon the fact, that the whole Graafian ovum cannot, as in birds, be transferred to the vector tube. "Hence in mammals," says he, "the inner vesicle (the true ovum) contains a richer vitellary matter, and as to the evolution of the fœtus, it certainly proves itself to be a true ovum." In saying this, he was nearly free from the shackles of his scholastic prejudice. They were strong enough, however, to cause him to write of the ovulum, "Ovum fetale dici possit in ovo materno. Mammalia ergo habent ovum in ovo; aut si hac dicendi formula uti licet, ovum in secunda potentia."

The Student, in reading the above, will candidly admit Von Baer's claims, though he will perceive how checked he was by the bonds of an old way of thinking. After all, the egg within an egg was, in his eyes, the true, separate, independent yelk-ball of the mammal.

The ovum of the bitch is $\frac{1}{20}$th to $\frac{1}{30}$th of a Paris line in diameter, according to Von Baer.

Now, notwithstanding M. Von Baer, as by the foregoing appears, is the discoverer of the mammal ovum, it is not doubted that Messrs. Prevost and Dumas had seen it in 1825—the year in which Purkinje detected the germinal vesicle. They, on two occasions, turned out and saw the ovulum of the Graafian ovi-capsule in the rabbit. Yet, the glory is Von Baer's.

As to the history of the Purkinjean vesicle in the mammal ovule, it appears now to be settled that the honor of its discovery belongs to Professor Coste, of the College of France, though several Germans have attributed it also to Von Baer.

M. Coste, in his *Histoire Générale et Particulière du Développement des Corps Organisés*, says:—

"I was at first accused of having copied M. Baer; but, inasmuch as the opinions I had set forth were diametrically opposed to those of that great physiologist, the public early did justice to a reproach so unfounded, and the improper criticisms of Mr. Robert Froriep were promptly repelled by Bernhardt himself, in his inaugural thesis, *Symbolæ ad Ovi Historiam*, p. 25. This reproach having been set aside, an attempt was next made to bestow upon others the credit it was impossible to assign to M. Von Baer. It was pretended that the discovery was made at the same time, *or nearly at the same time*, by M. Coste

in France, M. Bernhardt in Germany, and Mr. T. Wharton Jones in England. As to M. Bernhardt, it is enough for me to refer to that author's preface, in which he declares that his experiments were instituted for the purpose of ascertaining the correctness of my observations. Mr. Jones's publication is later by one year than mine; a statement that might suffice for the present occasion, were it not that that physiologist has himself fully recognized my rights as to the priority of discovery, in his report on Ovology in the *Brit. and For. Med. Review*, No. 32, 1843, a paper in which he lays no claim to it himself, but attributes it to me."

Thus far M. Coste, whose remark as to Bernhardt's preface is correct, as well as his citation of Mr. Jones's paper.

Mr. T. Wharton Jones's words are as follows:—

"By the discovery of the germinal vesicle, in the mammiferous ovarian ovum, the complete analogy between the latter and the ovarian ovum of the bird, &c., was established, and Baer's error regarding it dissipated. The correct view of the matter had been suspected by Purkinje, but he and Valentin had in vain searched for a germinal vesicle, and it was only on renewing their investigations, after the announcement that such a vesicle had been discovered in the rabbit's ovum by M. Coste, that they, Wagner, and others in Germany, were successful in finding it. M. Coste, therefore, as Bischoff observes, must, notwithstanding his very imperfect description and delineation of the germinal vesicle, be considered as its first discoverer."

This, it appears to me, is enough to enable the Student to see clearly the whole case; and I shall not further cite M. Coste, in his warm reclamations against M. Bischoff of Giessen.

It is much to be regretted that, amidst the tranquil pursuits of letters and philosophy, there should arise occasions for reproach—the more, as so much honor always remains to be shared by the diligent members of the Republic. The world is very ready to acknowledge the services and merits of all those wise, learned, and good men, who, like Purkinje, Baer, Coste, Wagner, Jones, Pouchet, and Bischoff, have in their publications endowed mankind with an impayable benefit.

The discovery of the mammal ovum was rendered complete by the detection, in 1830, of the macula germinativa or germinal spot, which is diversely attributed to Professor Rudolph Wagner and Mr. T. Wharton Jones; and it may be esteemed a conceded point that it was contemporaneously observed, as it was contemporaneously described, by those gentlemen in Germany and in England.

The germinal spot is, by Wagner, in his *Prodromus Historiæ Generationis Hominis atque Animalium*, page 4, called *primitive Keimschicht*

and *maculæ germinativæ*. Professor Wagner, in a note, page 44, Part I., *Elements of Physiology*, says:—

"I was myself the first to discover the germinal macula. I also described and figured the whole ovum in its successive stages with greater care and sequence than had yet been done."

Wharton Jones says: "At one side of the germinal vesicle there is a small, round, dark spot, discovered and described contemporaneously by Rudolph Wagner and the author of this report." (*Brit. and For. Med. Review*, 1843, p. 517.)

The germinal spot is from one-two-hundredth to one-three-hundredth of a Paris line in diameter. It consists of a collection of grains. Wagner's words, *Prodromus*, p. 4, are: "If the germinal vesicle in man and in the mammifers be carefully examined with the microscope at four hundred or five hundred diameters, there will be seen in one part of the vesicle a dark round spot."

In this way, he found it in mammals, birds, scaly amphibia, cartilaginous fishes, arachnids, certain crustaceans, all mollusks, conchaceans, echinoderms, medusans, and polyps. Upon a more minute examination, under still higher powers, there is seen a compressed orbicular stratum of a lenticular shape, composed of minute molecules, closely agglutinated in form of an acervulus, &c. &c.

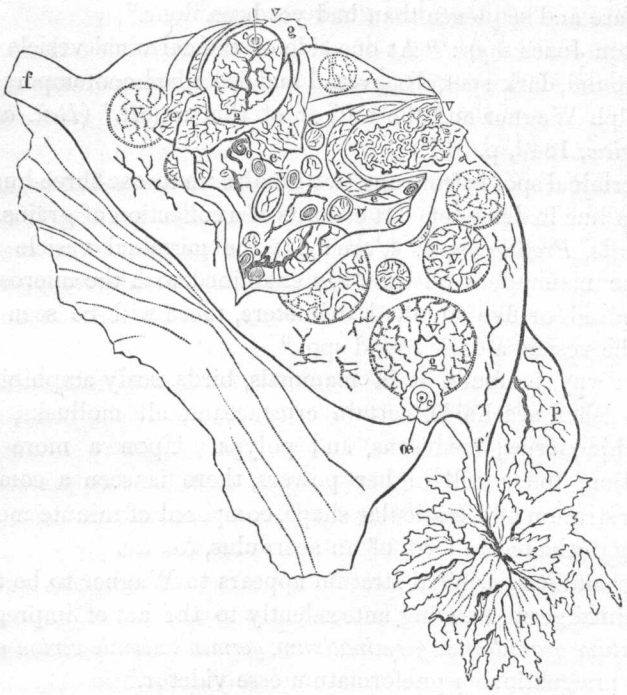
This granulous germinal stratum appears to Wagner to be the true living animal germ, existing antecedently to the act of impregnation. "*Hoc stratum granulosum germinativum, germen animale verum et vivum* jam ante prægnationem præformatum esse videtur."

Having now laid before the Student this account of the ovary, I shall annex a copy of M. Coste's magnified view of the ovarium from his grand atlas. In that superb plate, the figure is ten inches in its greatest diameter. Mr. Gihon has reduced it to this size. It was necessary to make it not more than four inches in diameter.

M. Coste's intention was not merely to exhibit the shape of the ovary greatly magnified, but to show the internal structure of it, and the various phases of the ovarian ova and their ovi-capsules during their maturation and the dehiscence and evacuation of the follicles. It is the left ovarium that is represented. The expanded fimbria *p*, of the Fallopian tube *p*, is seen at the lower and right extremity of the drawing. Near this angle is seen a Graafian follicle *v*, the dehiscence or rupture of which has allowed a yelk, surrounded by its proligerous disk or cumulus, to escape. The opening has taken place through the tunica albuginea and the peritoneal coat, and the ovule marked *œ* is still resting upon the exterior surface. Just above it is seen another less mature vesicle *v*, and a still smaller one above that,

while farther to the left is a very small one. The line of incision passes, near its lower angle, across a pretty large and superficial folli-

Fig. 44.

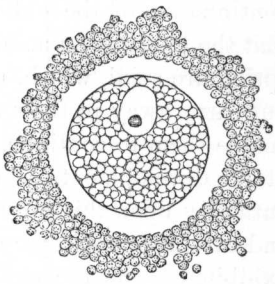


cle, one-half of which is seen through the coats of the ovary, while the other half is quite uncovered by the dissection, which has laid the organ open to view. To the right and upwards from this point is seen an emptied Graafian cell *v*, in which *e* is the outer surface of the whole cell. At *v* is the point of dehiscence, through which the egg escaped. This Graafian cell consisted of two coats or membranes, one contained within the other. The broken laciniæ of the double ovisac are seen at the upper end, near the margin of dehiscence, where they are marked *g* and *i*. These two coats are better represented in the follicle at the upper and left extremity of the cut—in which their floating and distinct membranes are seen at *e* and at *i*, whereas *g* indicates the granular deposits upon the inside of the follicle, which is called the tunica granulosa, or granular membrane. This granular membrane is so little tenacious that upon puncturing and compressing a cell, it flows out with the water, and appears upon the microscope as a collection of innumerable grains, that are probably cytoblasts.

Very near the superficial segment of this ovarian ovisac is seen the ovulum inclosed within its proligerous cumulus.

In order that the Student may here have a more complete idea of the ovary, I repeat the figure 45 of the human egg, taken from Rudolph Wagner's *Prodromus Histor. Generationis*, in which is seen the pellucid ring, surrounding and inclosing a quantity of yelk corpuscles, among which, near the top, rests a transparent vesicle with a dark spot upon it. The pellucid ring is the zona pellucida of the egg, outside of which is a quantity of granulous membrane that always comes out of the Graafian follicle sticking to the pellucid zone. It is necessary to remark that this figure is greatly magnified, for a very strong sight is required to enable any one to see without a lens the egglet, whose diameter is but the twentieth of a Paris line. The grains inside of the pellucid zone are grains of yelk—or vitellary corpuscles. They are yelk, true yelk, like that of a bird's egg. The oval transparent vesicle within them is the germinal vesicle, and the dark spot upon that vesicle is the macula germinativa—tache embryonaire—or germinal spot.

Fig. 45.



If the Student will look upon the germinal spot as the nucleolus, the germinal vesicle as the nucleus, and the vitellary membrane as the cell, he will have an idea of a true independent cell, possessing the metabolic and plastic forces that can enable it to develop itself wherever the proper cytoblastema, or pabulum, is afforded to it for that purpose—*i. e.* in the ovary, the tube, or the womb.

The production within the ovary of an ovum containing within it a germ, possessing, after its fecundation by the male, the power of evolution solely in the direction and dimensions of its own genus and species, is one of the most mysterious and wonderful works of God; one well fitted to overwhelm the mind with astonishment and make us feel amazed at the vastness and the indispensableness of those forces that are communicated by a Divine power to the simple and microscopic elements of the macula germinativa.

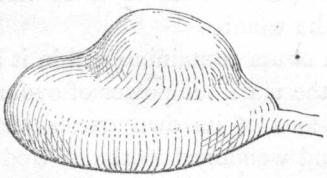
Burdach, in his *Physiology*, t. i. 87, speaking of the tubular ovary in which the materials of yelks are secreted in the cavity of the ovaries, in order to become ova, presumes this to be the mode in which ova are formed in all the insects, in most of the inferior crustaceans, in worms, and in certain mollusks. "Moreover," says he, "there is not the least doubt that the substances of which the egg is

composed, acquiring through the influence of the ovary their aptitude for a more elevated range of life, or already possessing it, tend partly also of themselves to take on a determinate form."

Is it a new creature that is formed out of the macula germinativa? is a question that has often been asked; or is it a propagation and continuation of the old or parent substance? M. Huschke proposes that the ovary is an aciniferous organ, and that the germs of the offspring are acini, which, under a physiological law, become deciduous, but carry away in their fall the vitality and accompanying forces that enable them to continue, after their separation, the pre-existing career of life development. I do not feel myself competent to speak with authority upon this proposition; I shall only state that very numerous and careful microscopic examinations of the ovarian stroma have not exhibited to me the evidences of the aciniferous nature of that substance; wherefore I am the more inclined to adopt the opinion of the cytoblast character of the germ point.

The Corpus Luteum.—Before I conclude my remarks upon the ovary, I ought to say something on the subject of the corpus luteum, a topic that has elicited an immense amount of discussion, and which still, perhaps, remains a *vexata questio*. Perhaps the principal interest that society has in the settlement of this question is one of a medico-legal nature; for although inquiries in this direction, of a medico-legal character, have not, so far as I am aware, led to any judicial decisions, I can conceive that important rights and interests might depend before a tribunal upon the views to be held as to the nature and interpretation of that singular product.

Fig. 46.



The corpus luteum, or yellow body, is a peculiar substance found in the ovaries of animals that have lately passed through the rutting season, and in women that have lately been affected with their menstrua, or that have become pregnant. In some pregnant women, the corpus luteum is either very small, or not readily discernible. In others, it attains a large size. In the cow, the corpus luteum (*vide* Fig. 46) is sometimes half as large as the ovary. It has been regarded as a sure sign of fecundation. I regard it as a sign of a finished ovulation.

On the 18th December, 1846, I made to the American Philosophical Society a verbal communication, setting forth certain views I had entertained as to the vitellary nature of the corpus luteum; and on

the 15th January I read a memoir upon the subject, which was published in the *Transactions*, 1847, p. 131. In that communication I stated that, since the date of my first verbal memoir, I had carefully made researches both with my Chevallier's microscope and by other methods, as to the comparative appearances of vitellary matter taken from the egg, and matter procured from fresh corpora lutea.

These renewed researches leave me very fully convinced that the yelk of eggs, and the yellow matter found in a corpus luteum, are of the same apparent structure, form, color, odor, coagulability, and refractive power.

Having placed a small quantity of yelk on the platine, and just before I had brought the object into the focus, I have been struck with the appearance of the transmitted light; a bright yellow, which fills the whole tube of the instrument.

When I have, in like manner, placed a bit of fresh corpus luteum, of the cow or sheep, on the compressor, and have crushed it, by turning the screw, I have found the tube filled with the same tinted light, before obtaining the focus.

A portion of yelk placed beneath the objective, exhibits numerous granules, corpuscles containing a yellow fluid, and oil-globules, mixed with a quantity of punctiform bodies.

Upon turning the screw of the compressor on a small lump of corpus luteum, carefully dissected out from its indusium, there is seen to escape from the crushed mass a quantity of granules, corpuscles filled with yellow fluid, oil-globules, and punctiform bodies swimming in a pellucid liquor.

The appearances observed upon examining a portion of yelk and a portion of corpus luteum, are so similar that it would be difficult, I think, to discriminate between them, but for the exception, that along with the vitellary corpuscles and granules and globules of the yellow body, there will be found flocs of laminated cellular tela, blood-disks, and other detritus of the organ, destroyed by the compressor.

The transparent corpuscles transmit a yellow light, whether observed singly, or in clusters, or acervuli.

The same is true of the corpuscles of the yelk.

On crushing a bit of corpus luteum with the compressorium, there escapes much granular matter that accurately resembles the granules of the granular membrane, the proligerous disk or the retinacula of the Graafian follicle. This is the case even when great precaution has been used to procure the bit from the outer superficies of the corpus luteum—avoiding to take any portion that might have touched the inner superficies of the crypt left by the escape of the ovulum.

The similarity in the appearances leads me to suppose an identity of nature and origin.

I think no person accustomed to the use of the microscope could detect any difference between the molecules pressed out of a bit of corpus luteum, and those that escape from a crushed mammiferous ovule, or the yelk of an egg, excepting the debris or detritus before mentioned, which is plainly referable to the destructive power of the compressorium.

I have so many times examined the mammiferous ovulum that I suppose myself quite competent to compare its contents with those of the corpus luteum, and with common yelk.

I hope I am entitled to say, that the coloring matter and the chief constituent bulk of a corpus luteum, is a true vitellary matter, deposited outside of the inner concentric spherule, or ovisac of the Graafian follicle.

For the proof of the truth of this opinion, I refer to the future observations of the micrographers, who will be able to confirm or to confute my statement.

There is not, so far as I know, any author who has taken this view of the constitution of the corpus luteum—though that substance has been the fruitful topic of elaborate research and hypothesis, owing to the interest connected with it both in a physiological and medico-legal relation.

Previous to the year 1825, when John Evangelista Purkinje fortunately discovered the germinal vesicle of the unfecundated egg; and down to the year 1827, when Ch. Ern. V. Baer detected the mammal ovum, whose germinal vesicle was detected by Coste; and the year 1830, when Rudolph Wagner ascertained the existence of the *Keim schicht*, or macula germinativa, all notions and opinions on the mammal ovum may be set down as naught—since the opinions of the learned are now based on the discoveries just mentioned, which have led to a complete revolution in many most important construings of physiological action, and therapeutical indication and treatment.

It would be bootless, therefore, to ask what the writers of an earlier date than 1825 may have supposed upon the subject of the corpus luteum.

Dr. Carpenter, John Müller, Thomas Schwann, Henle, and Huschke, have not hinted at the vitellary nature of the yellow body.

Dr. Henle, in his *Algemeine Anatomie*, says: "So weiss mann namentlich, wie die Gräfschen Bläschen, im folge der congestion welche den fruchtbaren beischlaf folgt, erst anschwellen und den platzen, wahrend sie zugleich von Blutt angefüllt werden, welches sie almahlig

entfarbt, organisirt, und in eine narbensubstanz verwandelt, die zuleszt verschwindet."—P. 894.

In this paragraph, Dr. Henle attributes the swelling and the bursting of the Graafian follicle to the congestion attending a fecundation. He says the ruptured cell is filled with blood, which colors it, becomes organized, converted into a scar-like substance, and then, at length, disappears.

Dr. Huschke, in his Treatise on Splanchnology, elaborately details the opinions of authors on the corpus luteum; but nowhere alludes to the vitellary nature of that body.

Dr. Gendrin, M. Maygrier, Dr. Robert Lee, Wharton Jones, M. Raciborski, Ollivier D'Angers, M. Pouchet, make no mention of it—though they all enter into details.

Dr. Montgomery, Dr. Swan, and, I think, Dr. Patterson, speak not of it.

M. Flourens, and M. Velpeau, and Dr. Moreau, omit all allusion to the vitellary structure of the substance.

Bernhardt, who was assisted in the construction of his *Symbolæ ad Ovi Mam. Hist. ante Prægnationem*, by Dr. Valentin, in which admired work is contained a complete deduction of the whole literature of the corpus luteum, alludes not to the idea.

Von Baer's celebrated letter, *De Ovi Mam. et Hominis Genesi*, says of the corpus luteum, at page 20: "Me judice, minime corpus novum est, sed stratum internum thecæ majus evolutum;" which expresses, with sufficient clearness, the opinions set forth in the rest of his paragraph.

Dr. Bischoff, of Heidelberg formerly, now of Giessen, in his *Entwickelungsgeschicte der Saugthiere und des Menschen*, says, at page 33:—

"Wenn mann die erste entwickelung des gelben Körpers, unmittelbar nach austritt des eies, bei Thieren beobachtet hat, so kann mann darüber nicht in zweifel seyn, dass die bildung seiner masse von den inner fläche des Graafschens Bläschens ausgeht. Da sich nun hier die aus zellen gebildete *membrana granulosa* befindet, da die zuerst als gelber Körper erkennbarre masse gleichfalls aus zellen besteht, so ist es wohl gewiss, das von einer starkeren entwickelung dieser zellen der *membrana granulosa*, die ich auch in der Peripherie des eies noch nachweisen werde, die bildung des gelben Körpers ausgeht."

From this passage, it seems that Dr. Bischoff is not far from discovering what I suppose myself to have discovered; I mean, the vitellary nature of the yellow body of the ovary.

It appears needless to make any further citation in this place.

I shall here offer the remark, that if the concave superficies of the ovisac, or inner concentric, is really charged with the office of producing or excreting the vitellary matter of the ovulum, which must be admitted, even if we allow to that body the metabolic and plastic cell-force (for it must, at least, be the producer of the cytoblastem of the cell), there is no very great difficulty in admitting that the convex or exterior superficies of the same membrane may exercise the same functions as the dominant of those elective affinities which must be supposed as to every vital excrete.

And such a supposition finds abundant support in the analogy of the organs; as, for example, in the periosteal and medullary membranes of bones; which, under certain circumstances, are known to alternate their functional force; the medullary membrane coming to be a depositor of phosphate of lime, instead of a remover; and the periosteum a remover, instead of being a depositor of phosphate, which is its normal office. This mutation of powers, as to the membranes of bone, has so clearly been described by M. Flourens, in his admirable paper on the production of bone and teeth, in the *Annales du Museum*, that it needs no comment.

But I am far from claiming this illustration for my view of the case, strong as I might deem it to be. It suffices for me to know that vitellary matter is germinal matter, germinal cytoblastem; and that the business of an ovary is to produce it—and nothing else in nature can produce it.

As to the microscopic results at which I have arrived, I have nothing more to do than tender them to the micrographers; and I should feel most happy if, these remarks meeting the eyes of Dr. Bischoff, or my kind friend, Dr. Pouchet, those gentlemen should deem them worthy of their attention, and confirmation or refutation. If they prove to be unfounded, I wish them to be confuted by better observers than I am.

As to some other points of resemblance between yelk and corpus luteum, I have now to observe, that boiled corpus luteum becomes hardened, like yelk boiled hard. It is, in like manner, friable and granular, leaving a yellow stain on paper, like the stain from boiled yelk.

Dr. Thomas Schwann found it evidently coagulated, granular, and friable, upon being boiled.

In order to ascertain its odor, I threw a portion of corpus luteum on a live coal;—it gave out a strong odor of roasted eggs.

Are the granules and corpuscles of the corpus luteum cytoblasts and cells? I have not been able so clearly to make out their nuclei as

to speak positively—I suppose them to be so. But Schwann, himself, who in one place seems to regard the nucleus as a *sine qua non* in cell-life, says, at page 204 of that most admirable and extraordinary volume the *Microscopische Untersuchungen:*—

"Die kernloser zellen, oder richtiger ausgedruckt, die zellen, in denen bisjetzt noch keine kerne beobachtet werden sind, kommen nur bei neideren pflanzen vor, und sind auch bei Thieren selten." Non-nucleated cells, or, more correctly speaking, cells in which nuclei have not as yet been detected, are found in the lower vegetables, and rarely also in animals. And he cites, as examples of the non-nucleated cell, the young cells within the old cells of the chorda dorsalis, the cells of the yelk of the bird's egg, &c. &c.

Be the non-nucleated vesicle a cell or not, it is very certain that the milk corpuscle, and, probably, the chyle corpuscle, are of that nature, —and no one can contemplate the amazing reproductive power of a cell or spore of the saccharomyces cerevisiæ, without admitting for it all the properties of the cell-force. It is to the last degree reproductive, as are also many of the filiform fungi, the muscardine, &c.

The question at last is, whether I have made a discovery interesting to the physiologist, the practitioner, and the jurisconsult. If I am right in my opinions, it must be interesting.

As a *résumé*, I say that my views are based upon the fact that—

1. Equal masses of yelk and corpus luteum are equally yellow.

2. They alike fill the microscope, before the focus is got, with a brilliant yellow light.

3. They alike consist of a pellucid fluid, in which float granules, corpuscles containing yellow fluid, oil-globules, and punctiform bodies.

4. These bodies, placed on the same platine, and diligently compared together, exhibit the same forms, size, tint, and refractive power.

5. Yelk, boiled hard, is granular and friable; it is coagulated by heat.

6. Corpus luteum, boiled, becomes hard, granular, and friable—it is coagulated by heat.

7. Both substances, raw or boiled, stain paper alike of a yellow color. This experiment was repeated after Bernhardt, who says: "Cujus pigmentum aurantiacum (cor. lut.), admotis digitis adhærescebat."—P. 39.

8. There is this difference: The crushed mass of corpus luteum contains patches of laminar cellular tela, detritus, and blood-disks forced out by the compressorium; which cannot occur in the yelk, as that is contained within a vitellary membrane, in which its corpuscles are free; whereas, in the corpus luteum, they are confined by the deli-

cate cellular substance lying betwixt the concentric laminæ of the Graafian follicle.

9. They refract alike.

10. Projected on a live coal, they alike give out the odor of roasted eggs.

As I derive this view only from my own perceptions, I ought perhaps to take leave of the matter here, committing it to more capable observers, in order to know whether they perceive it as I do. But, supposing that farther observations may probably confirm my views, I see no objection why I may not now offer some remarks, in the way of a rationale, upon the point in question, the more particularly, as I hitherto have relied only upon my own observations.

I therefore state that all living beings are results of the operation of a reproductive or generative force.

This is true both as to plants and animals; with the *possible* exception of certain fissiparous and gemmiparous creatures, as well as of certain sporiferous fungi, and some creatures of a higher scale, as the nais proboscidea, &c. I say of these, that they constitute a *possible* exception to the law of reproduction by germs. I do not say they are exceptions.

This reproductive force has the same relation to the conservation of the vegetable and animal genera, as the force of attraction has to the conservation of the brute masses of matter of the universe.

For it is obvious that, but for this force, all the genera would die out in a single generation, and yet it is apparent that nothing is more permanent than the genera, which extend from age to age, touching the beginning, the whole course, and the end of time. The existing genera are the same to-day as at the commencement of the present cosmic career, and are destined to be so until the last great cataclysm of the globe. M. Flourens, in his work on generation, makes use of the *mot*, the saying, *un être collectif*, a collective being, in speaking of the immutable permanence of a genus. This fine saying leads the mind at once to a view of the importance of the law of genesis by which so great an end is attained.

It would, perhaps, be superfluous to say that, but for the exercise of this force, all *morals* would be nullified and blotted out of the great scheme of Providence; for, should the genera fail or die out, the earth would become a desert; no flowers to bloom—no corn, nor wine, nor oil—no insect to sport in the sunbeam—no song of birds—no lowing of cattle—no voice of man to acknowledge, and praise, and give thanks to the Giver of every good and perfect gift. Thus the whole scheme of morals would cease and be terminated, leaving no

witness here to the power of God, beyond the senseless play of the elective and gravitating attractions.

Is it not clear, then, that the laws of this great conservative force must be most important laws? Can such great forces have little or no concern with the regulation and co-ordination of the other life forces? I repeat, that for life they have the same importance as appertains to the laws of attraction for the physical bodies of the globe.

This force is the true development force, not for the germ only, but for the embryo, the fœtus, the child, the youth, and the man. He who shall know it truly, shall know the laws of life.

It is not only a genetic, but a generic force. It determines the form and dimensions of the members of the genera in an interminable succession of ages. No horrid passion, no wild lust, no insane desire, can contravene the irreversible law of the distinction of the species and genera—"each after its own kind,"—which, but for its provisions, would rush into chaotic confusion and mixture—whereas they are, in truth, trenchantly divided, and set apart from each other, and forever maintained pure and unmixed.

This force—this amazing force, is concentrated and summed up in a special animal or vegetable tissue. Nothing in animals, save a vitelliferous tissue, can yield or give out this force. It is the endowment of the ovarian stroma. It is the peculiar life-property of that concrete, and of nothing else.

The stroma (Lager) of ovaries is a tissue developed and sustained by the combined agency of a spermatic or ovarian artery, and a spermatic nerve.

The spermatic nerves possess an intimate plexual and ganglionic relation to the spinal, the sympathetic, and the splanchnic systems of innervation—so that they are related, in fact, to all the organisms.

Under the dominant formative influence of the spermatic nerve, the ovaric artery, by its branches and termini, deposits the materials of the concrete of the stroma, with all its parts and mechanism.

The general relations of the ovary to the whole of the innervations, while they enable it largely to influence them all, render it liable to disturbance by their derangements. Its great influence is exhibited in pronouncing the single word sex, for the ovary is the sex of the woman—the female in the abstract. But if the ovary be her sex, then the whole peculiar physical, moral, and intellectual character of the female are derived from it, as their source and dominant—they are conformed to its wants, its powers, its offices—and often pathologically modified by its conditions.

The materials of development for all the organs are derived from

the blood, which, without violent misapplication of the metaphor, may be said to exist within a multilocular cyst, of which the cellulæ are the different sanguiferous tubes and sinuses of the vascular system. It is everywhere the same, and presents in each of the organs the same liquor sanguinis and disks—so that, although all development is effected at the expense of the blood, yet there is a constitutional, or esoteric nerve-force, by which to compel those elective attractions through whose power every living concrete is produced.

The physiologist knows that this esoteric force is nerve force—and he will not deny that, for the development of both a general and special anatomic structure, it must possess what I desire to characterize as a generic force, else all development would be in spherical forms, and of the same constituent elements.

No power can so modify the generic force of the cephalic extremity of the nascent embryotrophe as to protrude from it a pelvis or a foot; nor could a leg be possibly developed in the place of a prehensile limb. Even in the quadrumana the law holds good.

A liver whose development depends on its nutritious artery and its nerves, could by no means be formed at the caudal or cephalic pole of a mammal. It must always have its central position. No example will be found of a lung placed below the diaphragm. Hence, I say, the law of generic development is a law applicable not to the creature only as a whole, but to each of its several constituent parts. The whole business of zoological classification depends upon this law.

This law not only operates during the embryonal, the fœtal, and the puberic development, but is in force throughout the whole duration of life, perpetually repairing the organs, and maintaining their *generic* forms, against the wasteful detritus of life, until the cessation of life.

The membrana germinativa of the ovum, which is probably R. Wagner's macula (Keimschicht), is an elliptical or circular disk. Let me repeat what I just now said, that no power could determine the production of the pelvic at its cephalic, or the cephalic at its pelvic segment, nor a leg from the thoracic, or of an arm from the iliac region of the disk. Hence it is true to say, that such disk is endowed at different parts of it with a generic force, operative only in that one sole direction. I say generic, since the idea is applicable to all animals whatever, and to all the parts of animals.

My motive for making the foregoing remarks is, that they might serve as an induction or basis as to the generic force of *ovaries*.

An ovary is developed by an ovaric arterial trunk and its branches, drawing the vital current from the aorta or the emulgent, and attended

by the spermatic nerves, which I regard as reproductive nerves, and generic in their powers.

I say reproductive nerves, since their innervative force is devoted to the evolution of germs: no other nerve has such a mission.

If Huschke's pretty idea, that each Graafian follicle is a cast-off acinus of the stroma, carrying away in its fall an endowment of vital force rendered complete and generic by an act of fecundation, should prove to be well founded, I cannot escape from attributing this reproductive quality to the spermatic nerve.

But, without discussing the question of the aciniferous nature of the stroma, the same attribution of the nerve-power is right, even under the hypothesis of an independent cell-life—for a reproductive cell could not exist but for the vitellary cytoblastem provided by the stroma, which is a vitelliferous tissue, and only that. Nothing else is so. The nature of the cytoblastem must determine the differences of cells. The cytoblast of an oak germ is different from that of a cabbage germ, nor could they have the same cytoblastem.

But the sole office of an ovary is to produce or prepare germs—it is germiferous, and it is so by its power to form vitellary matter. No other combination or arrangement of animal materials can produce yelk or vitellus.

The complete germ is contained within a vitellary membrane—which is the boundary of the yelk. In the mammals, this yelk is microscopic. In the ostrich and the cassowary it is a very large ball, as it is in some of the larger ophidians, as in the coluber boæformis, &c.

The matured germ contained within a yelk is spontaneously and periodically extruded from the ovary, in order that it may be fairly exposed to the contact of the male fecundative element—which should be deemed impossible while it is buried within the recesses of the ovarium, covered by the double tunic of the follicle, and beneath both the fibrous and peritoneal indusium of the organ.

To effect this extrusion, this spontaneous oviposit, the inner concentric spherule of the follicle is compressed by the deposition on its external convex surface, of yelk grains, corpuscles, oil-globules, punctiform bodies, and pellucid fluid—the beginnings of the corpus luteum—which gives to the concave surface of the cell an appearance of corrugations or convolutions like those of the brain, and which, as they daily increase by the continued deposit of yelk matter on the exterior, constantly reduce the size of the interior dimensions of the follicle, urging its contents towards the least resisting point of the surface of the ovary, until, at length, the *porule* or *hila* being opened, by

the dehiscence of the coverings or capsule, the ovulum escapes into the fimbria, or falls into the peritoneal sac.

After the escape of the ovulum, the yelk-producing force is not in all cases immediately exhausted; hence the growth of the corpus luteum continues for a term whose limit is not yet known.

It is a periodical exacerbation of biotic force that matures and opens the Graafian cell. When the process of completing a germ and expelling it has been finished, the exacerbation ceases sooner or later, and a new periodical exacerbation of this strange life-force—or germ-producing force—is devoted to the maturation and spontaneous oviposit of another ovulum, and so on in succession, during the menstruating life of the woman; at every successive pairing season of birds; and at the annual rutting time of the more considerable mammals, and in all the migratory fishes at stated times.

It surprises me to see that many able and distinguished writers still cling to the antiquated notions as to the ovaric fecundation, which M. Pouchet has shown to be an impossibility. It appears to me that my view of the vitellary composition of the corpus luteum, and the mechanical result of its accumulation in effecting the oviposit, ought to be received as satisfactory rationale of the germ-depositing function. The fecundation of germs is a mystery which I deem beyond human cognition—and likely ever to remain so. The inquiry into the corpus luteum is far more feasible and practicable. No woman can menstruate but coincidently with, and in consequence of, the oviposit. Every oviposit is followed by a corpus luteum, which is larger or smaller, according to circumstances. Many women have scarce discernible ones after conception—others have very large ones. The true and the false corpora lutea differ only in magnitude—not in their essential nature.

I have no doubts as to the essential identity of nature in the corpus luteum of pregnant women and that of the virgin; and am pleased to find that the author of that admirable work, "*Die Geburtskunde mit einschluss der Lehre*," etc. etc., Franz A. Kiewisch, entertains the same opinion. It is true that this author appears not as yet to have learned the reasons for supposing the corpus luteum to be a vitellary material, or, at least, that he has not accepted that rationale of the corpus luteum. Still, he is evidently a careful observer, as well as good thinker.—He says, p. 80: "Da diese Erscheinung bei der Lehre von der Schwangerschaft erst genauer erötert werden soll, so schicke ich hier fur die Bemerkung voraus, das die Follicularesте bei jungfräulichen Individuen, obgleich sie in der Regel sehr unbeträchtlich zu sein pflegen, doch dieselbe Bedeutung haben, wie die bei schwangern

vorkommenden gelben Körpern, und dass ich in cingelnen scltenen Fällen auch bei nich geswhangerten Individuen bis zu Kirschengrosse entwickelte und gleichfalls exquisite gelbe Körper vorfand." Kiewisch says that the remains of the Graafian follicle, left after the ovulation in maidens, obey the same law that rules in the cases where conception has followed the ovulation—and where a true corpus luteum has been developed. He further says that, in some rare cases, he has found in the virgin the exquisitely characterized *corpus luteum* as large as a cherry.

In the first edition of this work, published in 1847, my statement of the corpus luteum stands as in the foregoing, and I have purposely left the text up to this point unchanged.

The preceding pages may show how considerable a mass is the literature of the corpus luteum, and how varying are the opinions heretofore entertained upon the subject.

It was on the 18th December, 1846, that I read my paper on the corpus luteum, at a meeting of the American Philosophical Society, and that paper was ordered for publication in the *Transactions*.

Deeply convinced as I was that I had fallen on a true and demonstrable rationale of the corpus luteum, I was willing to wait for the decision of the learned as to the truth of my explanation. Some of the reviewers treated me with less than civility for my innovation; but I perceived that they had condemned me on a *primâ facie* examination, and that their opposition depended rather upon a usual reluctance to abandon opinions already adopted, than upon any improbability of the truthfulness of my statements of the subject.

Professor Coste, whose second part of his 1st vol., on the development of organic bodies, was published in the summer of 1849, has adopted my views as to the vitellary nature of the luteal body. M. Coste regards the inner membrane of the Graafian follicles, and not the magma reticulatum lying betwixt the inner and outer cell, as the seat of the deposit. It is a matter of small moment, this, though I by no means yield my opinion on the authority of even so great a name as his.

Having sent my paper, from the *American Philosophical Transactions* of the year 1847, immediately upon its publication here, to M. Coste, I cannot withhold the expression of the surprise with which I find him acknowledging the receipt of it, and at the same time saying (in 1849, two years later), that I have arrived at the same conclusions with himself on this subject; that is to say, he got my paper in 1847, and, adopting my exposition, says, in 1849, that I have attained to the same views as he there so elaborately sets forth.

In order that the American Student may have an opportunity to become acquainted with M. Coste's views, I here translate from his *Dev. des Corps Org.*, p. 251, the following passages:—

"Indeed, upon examining with the microscope the texture of the internal layer of the capsule a short time before the period of its rupture, we find that, besides its abundant vascular network, it is exclusively composed of small vesicles or cells, each containing colorless molecular granules; but immediately after the dehiscence, they become so greatly developed that, when the convolutions fill up the cavity, they are found to be five or six times larger than they were at first. Hence it follows that the membrane whose wall they constitute must be proportionably thickened. It also becomes softer and more friable, because they cease to cohere so strongly as at first, while the wall itself becomes softened. This is the reason why, at a certain period, the capsular convolutions acquire an encephaloid appearance, the result of a modification both of the constituent vesicles and their contents, as I shall proceed to show. In process of time, a stage is reached in which the disunion of the vesicles is so easily to be effected, that it may be done by merely scraping the capsule, which detaches nearly the whole of them, after which nothing is left save the naked vascular branches that run along every plait. I have made this preparation in several follicles previously injected, so as to be able to see the facts in the clearest manner, as I have here described them.

"In proportion as the constituent vesicles enlarge, the contents are appreciably modified. In the cavity of each one of them is formed an innumerable quantity of molecular granules which renders them more and more opaque, and which, under the slightest pressure, pass out through the containing walls, that give way by laceration. These granules are remarkable, not only for their number, but also for the yellow tinge which slightly colors them. Now, as they are very abundant, and closely packed within the vesicles that contain them, it follows that the yellow tinge that is slight in the individual granules becomes very decided as for the whole mass of them. It appears that something takes place here like what occurs in the vitellus of the bird while taking on its yellow hue. I have, indeed, already said, while explaining the material conditions of this phenomenon, that it is produced by the crowding together of the granules with which the yelk corpuscles are gradually filled, and by the admixture of the oleaginous particles that are disseminated in it. The color of the corpus luteum seems to depend upon an analogous arrangement of the material contained in the voluminous vesicles that compose its mass," &c.

Let the Student do me the favor to compare this account by the learned Frenchman with that in the first edition of this work, and I feel sure he will do me the justice to admit the priority of my solution of this long questioned problem.

I beg leave to make one more quotation, which is from M. Coste, p. 268: "Baer first understood the mechanism by means of which the plaits and convolutions are produced. Pouchet showed how they become thickened; and I think I can establish the fact that the color of them depends exclusively on the nature of the molecular granules or the globules with which the cells that form these walls are filled, and not at all, as supposed by Raciborski and Pouchet, on an extravasation of the coloring matter of the blood. I have observed with pleasure, in a pamphlet sent to me by Dr. Meigs, that, in the last respect, that observer had come to the same conclusion as my own."!! Prof. Coste should have said that he adopts Dr. Meigs's views in this last respect.