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SEXUAL PHYSIOLOGY:

A Scientific and Popular Exposition

OF THE

FUNDAMENTAL PROBLEMS IN SOCIOLOGY

BY R. T. TRALL, M. D.,

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P R E F A C E .

As several years have elapsed since this work was first advertised as in preparation and soon to be published, some apology for, or explanation of, the causes of the long delay may be due to the public, and more especially to those who have sent in their subscriptions months and years in advance, and who have waited its appearance, patiently or impatiently, as the case may be. Perhaps it may be sufficient to say that *it could not have been otherwise*. One reason, however, why its day of publication has been so many times postponed to a more convenient season, was the engrossing duties of professional life. But another, and, probably, not the least important of the two, was the desire to solve and demonstrate certain problems which greatly concern the well-being and progress of the human race, which have baffled the investigations of philosophers in all ages, and which the position and correspondence of the author afforded facilities to study and elucidate, never perhaps possessed by any other person.

While this work aims and claims to be, so far as anatomical and physiological problems are concerned, rigidly scientific, and to be posted, up to the hour of going to press, in all the discoveries of this rapidly advancing age, so far as they come within the scope of its plan and purpose, its style, arrangement and application are addressed to the popular rather than to the professional reader. Editors and medical gentlemen,

therefore, who honor the work with their notices and criticisms, will please bear in mind the fact that its sole object is to instruct the masses of the people on those subjects which have hitherto been to them as a sealed book.

So far as the author is aware, this is the first attempt to popularize, in a scientific work, the subject of Sexual Physiology. The public has too long ignored as indelicate, or as too intricate and mysterious to be comprehended except by those who are educated in all the branches of the medical profession, the subjects which lie at the very foundation of their earthly well-being; while the medical profession has wrapped its knowledge, vague and unsatisfactory as it is, in so many folds of technicalities, that the non-professional readers find little except "confusion worse confounded" in the standard-works.

That all of the readers into whose hands this work may fall will assent without further investigation to all of the doctrines propounded, is more than the author can expect, or even desire; nevertheless each proposition advanced has been carefully studied and deliberately adopted, and, in his opinion, contains a truth which the whole world would be benefited by understanding and practising.

R. T. T.

NEW YORK, *January*, 1866.

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PROEMIAL.

FROM the time when first "the morning stars sang together" no problem has occupied the attention of the human mind more profoundly than that which concerns the Origin of Life; and no language can exaggerate the importance of a correct and complete knowledge of the sexual functions and relations.

Self-preservation being the first law of Nature, the most powerful instinct of all living beings must inevitably be the desire for food—Alimentiveness. And as the perpetuation of the race is next in order and of equal importance, the sexual passion, Amativeness, must be regarded as the second fundamental power of the affectuous mind. The simple declaration of the Mosaic record, "male and female created He them," applies with equal truth to all the myriads of the animal and vegetable kingdoms, and even to the creations of the microscopic world, as to man.

In view of these premises it would seem to be almost self-evident that man's happiness or misery in this life depends chiefly and primarily on the use or abuse of these two phrenological organs—not that I ignore the other mental powers, or in any degree undervalue the importance and influence of the

intellectual faculties, the moral sentiments, and the religious emotions.

As we trace human history in all of its changes and vicissitudes—the development and degradation of individuals, the institution and decline of societies, the establishment and overthrow of governments, and the rise and fall of nations, we readily find that vice and crime, dissipation and debauchery, disease and premature death, are traceable more to abuses of these two fundamental and controlling propensities, than to all other causes combined. And if we examine the subject in the light of Vital Laws, and with a philosophical spirit, we shall hardly fail to see that these abuses are nearly all attributable to simple ignorance.

It has been my painful professional duty to investigate the history and prescribe for thousands of “ruined young men,” and not a few equally ruined young women, whose errors and infirmities would, in all human probability, never have occurred, had their parents or some intelligent friend in early life instructed them in what every child should know as soon as it is able to understand—the uses of the sexual organs.

Nor is the evil resulting from ignorance and abuse much less in married life. We need only glance at those extremes of theories and practices now, as long heretofore, agitating the public mind, Polygamy and Free Loveism on the one side, and Monogamy and Shakerism on the other, to comprehend the fact that the problem of the true sexual relations is not yet fully understood.

And I must here lay down a proposition which may startle some and displease many; but which, nevertheless, in my judgment, lies at the very foundation of all great and endur-

ing improvements in Sociology. God and Nature have given to the female the supreme control of her own person, so far as sexual congress and reproduction are concerned—indeed for any and for all purposes. The whole animal kingdom below man recognizes this law. If man does not, he outrages woman and degrades himself. No male animal offers violence to the female; he never compels her to submit to the sexual embrace against her desire, nor forces her to bear offspring against her inclination or will. But, when she is in condition to propagate her kind, and desires the co-operation of her male partner, she informs him of it. He always responds to her solicitation, but never compels her to submit to the mere gratification of his lust.

So it is in the order of Nature, and so it should be in practice with human beings. I am not here advocating the doctrine that sexual intercourse, with human beings, as with animals, should be limited to reproduction—a mere generative act. This question is not now in order. But what I mean is, that sexual intercourse, for any purpose, should be, under all circumstances, for the female to accept or refuse, and not for the male to dictate or enforce. Recognize in women this God-given right, which man has deprived her of, solely because the function of maternity, and a less selfish organization, rendered her practically, in this respect, “the weaker vessel,” and the questions of “woman’s rights,” “woman’s sphere,” “woman’s equality,” etc., would soon settle themselves; and man would find, in the higher elevation and superior healthfulness of woman, his own nature correspondingly ennobled, and his happiness proportionately increased.

That the majority of human beings all over the civilized

world are begotten recklessly of all physiological conditions, with no considerations of duty or propriety, and with little or no thought for the welfare of the future generations, a very little reflection will enable any one to understand. This is not so with regard to domestic animals. Very few agriculturists are so regardless of the laws of health as to allow their cattle to propagate except under favorable circumstances for their own health, and the vigor and beauty of the progeny. They would never allow the sexes to come together for reproduction after a hard day's toil; while either was in a state of fatigue or excitement, or in any condition of bodily exhaustion or disorder; nor while in any state of mental anxiety, despondency, anger or grief.

Nothing is clearer than the fact that organization is transmissible, and nothing is better established, if, indeed, it is not self-evident, that the qualities—the bodily and mental states—of both parents at the moment of conception, affect the future being for life, while it is equally demonstrable that the wholesome or unwholesome conditions and surroundings of the mother, her happy or unhappy circumstances, through the periods of gestation and lactation, continually affect and modify the organization of the offspring for good or for evil. Nay, more, the very germ of life—the ovum itself—is affected while in process of development in its ovarian bed, by whatever influences or disturbs her functions of body or of mind. The renovation of the race, therefore, must begin with the proper training of those who are to develop the germs—in girlhood, yes, in infancy.

Health Reformers are beginning to attach due importance to air, food, water, exercise, light, etc., as means for the preser-

vation of health and the removal of the causes of disease. But the starting-point of the Gospel of Health lies further back. It should begin with the primordial germ. The union of the germ-cell of the female with the sperm-cell of the male (not their contact merely, but their actual minglement) produces a new being, and the new being will be endowed for ever, so far as this life is concerned, with the good or bad qualities predominant in the parents when that inter-blending occurs. I have known cases in which, from the feasting and drinkings which celebrated the wedding occasion, the "first born" were rendered idiotic. Children are often from birth stamped through their whole organization with the depravities, propensities, infirmities, eccentricities, and disordered conditions which one or both parents exercised during the act of reproduction.

The normal condition and exercise of the sexual organs, so far from diminishing sexual pleasure or gratification, would actually augment it. The dyspeptic stomach may crave food continually, and never be satisfied. The gormand eats continually, but less to enjoy a normal sensation than to administer to an insatiate lust; and the person who is addicted to alcohol, tobacco, tea, coffee, etc., does not take them so much because he enjoys them, as to appease the wretchedness he feels without them. He has formed a sorry habit, created a morbid appetency, and he must either crucify it and restore the normal condition, or he must go on pampering it and aggravating the evils which result from the vital expenditure.

And so it is with the sexual passion. While morbid **amativeness** is as insane and ungovernable as a dyspeptic stomach,

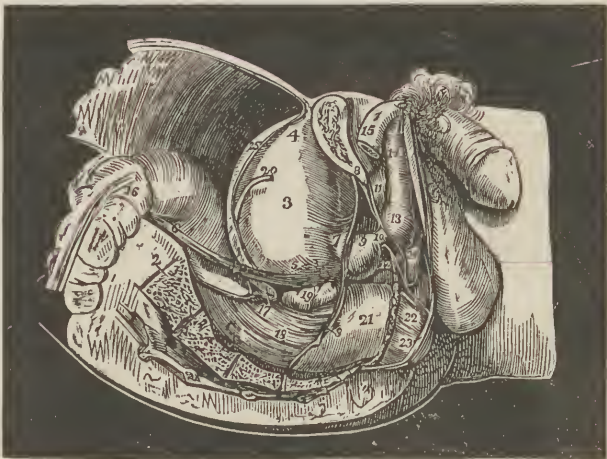
it is as little satisfied with any extent of indulgence, and the cure for sexual sensuality, as well as for perverted alimentiveness, consists, not in pampering the depraved propensity, but in restoring the normal instinct. And this is not so very difficult. All that is required is the right education of the rising generation.

CHAPTER I.

MALE ORGANS OF GENERATION.

THE VISCERA OF THE MALE PELVIS ARE THE URINARY BLADDER, PROSTATE GLAND, VESICULÆ SEMINALES AND THE RECTUM, OR LOWER PORTION OF THE BOWEL.

FIG. 1.



SIDE VIEW OF THE VISCERA OF THE MALE PELVIS.

1. Divided surface of the os pubis. 2. Divided surface of the sacrum. 3. Body of the bladder. 4. Its fundus; from its apex is seen passing upward the urachus. 5. Base of the bladder. 6. Ureter. 7. Neck of the bladder. 8, 8. Pelvic fasciæ. 9. Prostate gland. 10. Membranous portion of the urethra. 11. Triangular ligament. 12. One of Cowper's glands lying beneath the membranous portion of the urethra. 13. Bulb of corpus spongiosum. 14. Body of corpus spongiosum. 15. Right crus penis. 16. Upper part of the first portion of the rectum. 17. Recto-vesical fold of peritoneum. 18. Second portion of the rectum. 19. Right vesicula seminalis. 20. Vas deferens. 21. The rectum covered by the descending layer of the pelvic fascia. 22. Part of the levator ani muscle investing the lower part of the rectum. 23. External sphincter ani. 24. Interval between the superficial perineal fascia and triangular ligament.

The above cut and explanations are given to show the

relation between the pelvic viscera and the generative organs.

The male organs of generation are the penis and testes, with their appendages.

THE PENIS.—The penis is the organ of copulation, and is divided by anatomists into a root, body and extremity, or glans penis.

The *root* is broad and firmly connected to the rami of the pubes by two fibrous processes, termed the *crura*, and to the front of the symphysis pubis by a fibrous membrane, the *suspensory ligament*.

The *extremity*, or *Glans Penis*, resembles an obtuse cone, with a vertical slit in its apex, termed the *meatus urinarius*, orifice of the urethra. At the back part of this orifice is a fold of mucous membrane, passing backward to a depressed raphe, termed the *frænum preputii*. The rounded projecting border of the base of the glans is termed the *corona glandis*; behind the corona is a deep constriction, the *cervix*. On each of these parts are numerous lenticular glands, the *glandulæ Tysonii* seu *odorifera*, which secrete a sebaceous matter of a peculiar odor.

The *body* of the penis is covered by integument remarkable for its thinness and its absence of adipose tissue. When erect it becomes somewhat triangular in form with rounded angles, the broadest side, called the *dorsum*, being upward. At the neck of the glans the integument leaves the surface of the penis and becomes folded on itself, forming the *prepuce*.

The penis is composed of erectile tissue inclosed in three cylindrical fibrous compartments. Two of these compartments, the *corpora cavernosa*, are arranged side by side along its upper part; the third, the *corpus spongiosum*, is placed below and incloses the urethra.

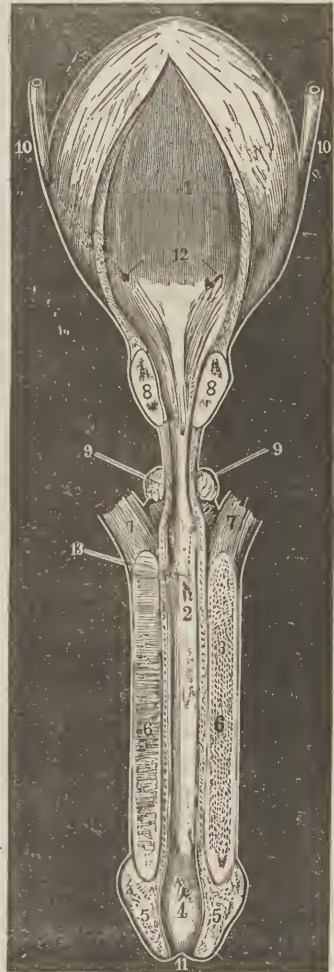
The *Corpora Cavernosa* consist of two fibrous cylindrical tubes forming the chief part of the body of the organ, imperfectly separated by a *fibrous septum*.

The *Corpus Spongiosum* is situated in a groove on the under surface of the corpora cavernosa, and, like the corpora cavernosa, is largely composed of *erectile tissue*, which consists essentially of an intricate venous plexus capable of receiving a large amount of blood in states of excitement or congestion. The *arteries* of the penis are derived from the internal pudic; its *nerves* from the internal pudic nerve and the hypogastric plexus. The organ has two sets of *lymphatic vessels*, one superficial and the other deep.

The male *Urethra* extends from the neck of the bladder to the meatus urinarius. Its length in the adult is usually eight or nine inches; its course has a double curve, in its flaccid state, but in the erect condition it forms only a single curve, the concavity of which is directed upward. It is divided into three portions, the prostatic, membranous and spongy.

The *Prostatic portion* is the widest and most dilatable part, and passes through the prostate gland. It is about an inch and one quarter in length. Upon the floor of the canal

FIG. 2.



BLADDER AND URETHRA.

is a narrow ridge, the *veru montanum* or *caput gallinaginis*,

formed of mucous membrane and its subjacent tissue. When distended it serves to prevent the passage of the semen backward into the bladder. A fossa or depression on each side of the *veru montanum* is called the *prostatic sinus*, the bottom of which is perforated with numerous apertures, the *orifices of the prostatic ducts*.

The *Membranous portion* of the urethra extends between the apex of the prostate and the bulb of the *corpus spongiosum*.

The *Spongy portion* is the longest part of the urethra, and is contained in the *corpus spongiosum*. It is about six inches in length, and extends from the membranous portion to the *meatus urinarius*.

The *Meatus Urinarius* is a vertical slit about three lines in length, and is the most contracted part of the urethra.

The *Urethra* is composed of three coats, a mucous, muscular and erectile.

The *Prostate Gland* is a small glandular body surrounding the neck of the bladder and commencement of the urethra. In shape and size it very much resembles a horse-chestnut. Its secretion is a milky fluid, having an acid reaction, and presenting, on microscopic examination, molecular matter. This gland is frequently enlarged, and its ducts filled with concretions, especially in old age.

Cowper's Glands are two lobulated bodies of a yellowish color, about the size of peas, situated beneath the forepart of the membranous portion of the urethra, between the two layers of the deep perineal fascia, and lying close behind the bulb. The excretory duct of each gland is nearly an inch in length, and passes obliquely forward beneath the mucous membrane, opening by a minute orifice on the floor of the bulbous portion of the urethra. They diminish in size in advanced age.

The *Testes* are the glandular organs which secrete the semen. They are situated in the scrotum, being suspended by the spermatic cord. Lying upon the posterior border of each testis is a narrow, flattened body, termed the *epididymis*.

Attached to the upper end of the testis, or the epididymis, is a small pedunculated body, the use of which is unknown.

The *Scrotum*, which contains the testes and part of the spermatic cord, is a cutaneous pouch, divided into two lateral halves, by a median line or raphe, and consisting of two layers, the integument and the dartos muscle.

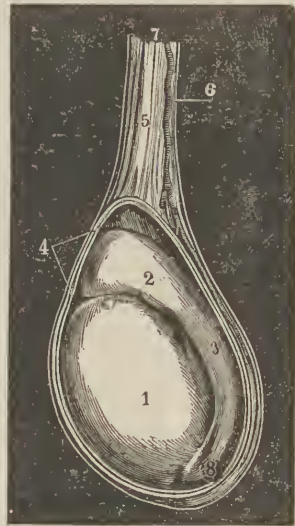
The *Tunica Vaginalis*, the serous covering of the testis, is a pouch of serous membrane, derived from the peritoneum during the descent of the testis in the foetus, from the abdomen into the scrotum.

The *Tunica Albuginea* is the fibrous covering of the testis. It surrounds the glandular structure of the organ, and, at its posterior and upper border, is reflected into the interior of the gland, forming an incomplete vertical septum, called the *corpus Highmorianum* or *mediastinum testis*.

The *Tunica Vasculosa*, or *pia mater testis*, is the vascular layer of the testis, consisting of a plexus of blood vessels, held together by delicate areolar tissue.

STRUCTURE OF THE TESTIS.—The glandular structure of the testis consists of numerous lobules, estimated at two hundred and fifty to four hundred. Each lobule is of a conical shape, the base being directed toward the circumference of the organ, the apex toward the mediastinum. The tubes may be separately unraveled, by careful dissection under water. Their diameter varies from one two-hundredth to one one-hundred-and-fiftieth of an inch. They consist of a basement membrane, lined by epithelium,

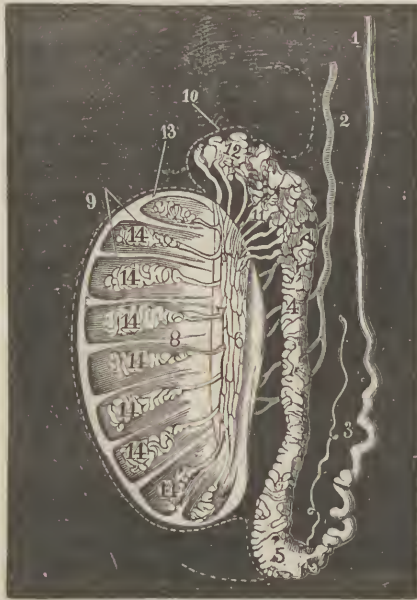
FIG. 3.



THE TESTIS IN SITU.

consisting of nucleated granular corpuscles, and are inclosed in a delicate plexus of capillary vessels. In the apices of the

FIG. 4.



VERTICAL SECTION OF THE TESTIS.

lobules the tubuli become convoluted, and unite together so as to form twenty to thirty larger ducts, of about one-fiftieth of an inch in diameter, which, from their straight course, are called *vasa recta*.

The *Vasa Recta* enter the fibrous tissue of the mediastinum, and pass upward and backward, forming a network of anastomosing tubes with very thin parieties, constituting the *rete testis*. The vessels of the rete testis terminate at the upper end of the mediastinum in a number of ducts, varying from twelve to twenty, which are termed *vasa efferentia*. They carry the seminal fluid from the testis to the epididymis.

The *Vas Deferens*, the continuation of the epididymis, is the

excretory duct of the testis. It ascends along the inner side of the testis, and epididymis, through the spermatic canal, to the internal abdominal ring. Its walls are thick and dense, but its canal is very small, measuring but half a line.

The *Spermatic Cord* is composed of arteries, veins, nerves, lymphatics and the vas deferens, connected by areolar tissue, and invested by its proper coverings. It extends from the internal abdominal ring to the back part of the testicles. The left cord is usually longer than the right, which occasions the left testicle to hang somewhat lower than the right.

VESICULÆ SEMINALES.—The Seminal Vesicles are two membranous pouches between the base of the bladder and the

FIG. 5.



VASA DEFERENTIA AND VESICULÆ SEMINALES.

rectum. They serve as reservoirs for the semen, and secrete a fluid which is mixed with that of the testicles.

Each vesicula consists of a single tube coiled upon itself, and giving off several irregular diverticula.

The *Ejaculatory Ducts*, one on each side, are formed by the junction of the duct of the vesicula seminalis with the vas deferens.

The *Semen* is a thick whitish fluid, having a peculiar odor. It consists of a fluid portion called the *liquor seminis*, and solid particles termed seminal granules and spermatozoa.

The *Seminal Granules* are round corpuscles, measuring one four-thousandth of an inch in diameter.

The *Spermatozoa* are the essential agents of impregnation, or rather the elements which mix with the elements of the egg or ovum, by which process fecundation is effected. They are minute, elongated particles, with an oval extremity or body, and a long slender filament. They move in a undulatory manner, and are supposed by many physiologists to be animalcules.

CHAPTER II.

FEMALE ORGANS OF GENERATION.

THE sexual organs of woman are the Mons Veneris, the Labia Majora and Minora, the Clitoris, which, with the orifice of the Vagina, constitute the "Vulva" or "Pudendum," and the Vagina, Uterus, Fallopian Tubes and Ovaries.*

The *Mons Veneris* is the prominence in front of the pubes, surmounting the vulva, and, at the period of puberty, covered with hair. It consists of a collection of adipose matter beneath the integument.

The *Labia Majora* are the longitudinal cutaneous folds extending from the mons veneris to the perineum, and inclosing the urino-sexual opening. They are formed externally of integument covered with hair, and internally of mucous membrane. Their junction above and below constitute the *anterior* and *posterior commissures*. The interval between the posterior commissure and the anus is called the *perineum*. Within the posterior commissure is a small transverse fold called *frænum pudendi* or *fourchette*, and which is commonly ruptured in the first parturition. The labia are analogous, in structure, to the scrotum in the male.

The *Labia Minora*, or *Nymphæ*, are two small folds of mucous membrane within the labia majora, extending from the clitoris downward and outward for about an inch and a half on each side of the orifice of the vagina, on the sides of which they are lost. They are provided with numerous large mucous crypts which secrete sebaceous matter in abundance.

* See next page for illustration.

FIG. 6.



THE VULVA.

Though anatomists and physiologists say little or nothing of the function of the *nymphæ*, the structure and situation seem very clearly to indicate that it is to press the clitoris more firmly upon the dorsum of the penis in the act of coition; and also, perhaps, to compress, in some degree, the male organ. Sexual pleasure, therefore, especially on the part of the female, if this view be correct, is, to a great extent, dependent on the vigor and integrity of its tissue.

The *Clitoris*, the analogue of the male penis, is an erectile structure, and the principal organ of sexual pleasure in the female, for which purpose it is profusely supplied with nerves. It is situated a little back of the meatus urinarius, beneath the anterior commissure, and is partly hidden between the anterior extremities of the labia minora. Its body is short and concealed beneath the labia; its free extremity, termed *glans clitoridis*, is a small rounded tubercle, consisting of spongy erectile tissue, and is highly sensitive. Like the penis, it is provided with two small muscles, the *erectores clitoridis*, and a suspensory ligament. The triangular smooth surface between the clitoris and the entrance of the vagina, and bounded on each side by the nymphæ, is the *vestibule*.

The *Meatus Urinarius*, or orifice of the urethra, is situated at the posterior part of the vestibule, about an inch below the clitoris and near the margin of the vagina. It can readily be distinguished by the prominent elevation of mucous membrane which surrounds it.

The *Hymen* is a thin fold of mucous membrane extending across the lower part of the orifice of the vagina. Occasionally the hymen forms a circular septum closing the orifice of the vagina, constituting what is termed *imperforate hymen*, preventing the discharge of the menstrual fluid, and proving a successful barrier to sexual intercourse and pregnancy. The hymen is, however, often destroyed by disease, and is occasionally absent altogether. Its presence is not a proof of virginity, nor is its absence any evidence of unchastity. The rudimentary condition of the hymeneal membrane, as well as

its rupture, explain certain small rounded elevations which surround the opening of the vagina, the *caruncula myrtiliformes*.

The *Glands of Bartholine* (analogues of Cowper's Glands in the male) are round oblong bodies, of a reddish-yellow color, one of which is situated on each side of the commencement of the vagina. Each gland is of the size of the horse-bean, and opens by means of a long single duct upon the inner side of the nymphæ, external to the hymen. A plexus of veins inclosed in a thin layer of fibrous membrane, constituting two oblong bodies about an inch in length, extend from the clitoris along either side of the vestibule, termed by KOBELT, who considers them analogous to the bulb of the corpus spongiosum in the male, the *bulbi vestibuli*. In front of these bodies is a smaller plexus of veins called the *pars intermedia*.

The *Blaäder** is situated in the anterior part of the pelvis, with the os pubis in front and the uterus behind. It is larger in the female than in the male, and very broad in its transverse diameter.

The *Urethra* is a narrow membranous canal, about one and a half inches in length, extending from the neck of the bladder to the meatus urinarius. Its diameter, when undilated, is about a quarter of an inch. It consists of three coats, muscular, erectile and mucous.

The *Vagina* is a membranous canal in the centre of the pelvis, extending from the vulva to the uterus. Its direction is curved forward and downward. Its length is about four inches along its anterior wall, and five or six inches along its posterior wall. It is narrow and constricted at its commencement, but becomes dilated near its uterine extremity. It is attached to the neck of the uterus a little above the os uteri, so that the mouth of the womb projects a short distance into the vaginal canal. It is one of the chief supports of the uterus, and its weakness and relaxation is one of the principal causes of prolapsus and other uterine displacements.

* For illustration see next page.

FIG. 7.



VISCERA OF FEMALE PELVIS.

Its structure consists of an external muscular coat, a layer of erectile tissue, and an internal mucous coat or lining.* Its posterior surface is connected with the anterior wall of the rectum, for the lower three-fourths of its extent, the upper fourth being separated from that tube by the recto-uterine fold of peritoneum, which forms a *cul-de-sac* between the vagina and rectum.

The *Mucous Membrane* of the vagina is continuous, above, with that which lines the inner surface of the uterus, and below, with the integument which covers the labia majora. Along the anterior and posterior walls its inner surface presents a longitudinal ridge, called the *column of the vagina*, and numerous transverse ridges or rugæ extend outward from the column on each side. These rugæ are more prominent near the orifice of the vagina, especially in females before childbirth. They serve to facilitate the dilation of the part during parturition. The mucous membrane is covered with conical and filiform papillæ, and provided abundantly with mucous glands and follicles, which are especially numerous in its upper part, and around the cervix uteri.

The *Uterus* is properly the organ of gestation. Its office is to retain and support the fecundated ovum during the development of foetal life. In the virgin stato it is pear-shaped, occupying the cavity of the pelvis between the bladder and rectum, measuring two and a half or three inches in length, two inches in breadth at its upper part, about one inch in thickness, and weighing from an ounce to two ounces and a half. Its upper broad extremity is called the *fundus*, and its lower rounded and constricted portion the *cervix* or neck. The *body* of the organ gradually narrows from the fundus to the cervix. At its vaginal extremity is a transverse aperture called the *os uteri*, or mouth of the womb, bounded by an anterior lip which is thick, and a posterior one, long and narrow.

There are six ligaments of the uterus, all of which are

* The erectile tissue is more abundant at the lower than at the upper part of the vagina.

formed of peritoneum. The *two anterior ligaments* (vesico-uterine) are two semi-lunar folds extending between the neck of the uterus and the posterior surface of the bladder. The *two posterior ligaments* (recto-uterine) extend between the sides of the uterus and rectum. The *two lateral or broad ligaments* form a septum across the pelvis, dividing the cavity into two portions, the anterior of which contains the bladder, urethra and vagina; the posterior part contains the rectum.

The *Cavity of the Uterus* is comparatively very small, the upper portion, corresponding to the body of the organ, being triangular, with a small opening at its inferior extremity, the *ostium internum* (internal orifice), which leads to the cavity of the cervix. Each wall of the uterine canal presents a longitudinal column, from which extend small oblique columns somewhat resembling branches from the stem of a tree, hence this arrangement is termed *arbor vite uterinus*. After parturition these folds are much less distinct.

The *structure* of the uterus consists of three coats; the external of which is serous, the middle muscular, and the internal mucous. The chief bulk of the organ is constituted of its muscular coat, which is remarkably firm and dense. In the impregnated state the muscular tissue becomes more developed and disposed in three distinct layers.

The *Mucous Membrane* of the uterus is continuous through the Fallopian tubes with the peritoneum, and through the os uteri with the mucous coat or lining of the vagina. Around the os uteri are numerous mucous follicles and glands. Small vesicular elevations are often found within the os and cervix uteri, caused by the closure of the mouths of these follicles, and their distension with their proper secretions. They are termed the *ovula Nabothi* (ovula of Naboth).

The *arteries* of the uterus are remarkable for their tortuous course and frequent anastomoses in the substance of the organ. The *veins* are very large, and correspond in arrangement with the arteries. In the impregnated state the veins are termed the *uterine sinuses*, which consist of the lining mem-

brane of the veins attached to the walls of canals extending through the substance of the uterus and terminating in uterine plexuses.

During the menstrual period the uterus is enlarged and more vascular; and during pregnancy it increases in weight to two and sometimes three pounds. After parturition it soon returns to nearly its usual size, weighing only from two to three ounces.

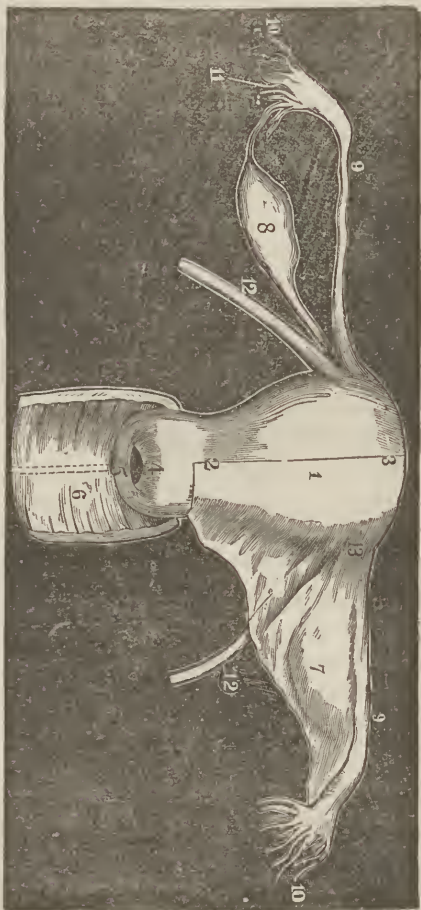
The *appendages* of the uterus are the Fallopian tubes, the ovaries and their ligaments, and the round ligaments. They are inclosed between two folds of peritoneum, which constitute the broad ligaments.

The *Fallopian Tubes*,* or oviducts, each of which is about four inches in length, extend from each superior angle of the uterus to the ovaries; their office is to convey the ova from the ovaries to the cavity of the uterus. Each tube consists of a serous, muscular and mucous coat. Its canal is exceedingly small, hardly admitting a fine bristle. Its uterine orifice, which is very contracted, is termed the *ostium internum*, and its external orifice the *ostium abdominalis*. Near the ovary the tube widens into a trumpet-shaped extremity. Its ovarian orifice is surrounded by fringe-like processes termed *fimbriæ*, and one of these processes is connected with the ovary. This part of the tube is called its *fimbriated extremity*; it has also been termed *morsus diaboli*, from the manner in which it closes around and embraces the ovary during sexual excitement.

The *Ovaries* are oval-shaped, and in structure quite analogous to the male testicles. Each ovary is about an inch and a half in length, three-quarters of an inch in width, about one-third of an inch in thickness, weighs from one-eighth to one-fourth of an ounce and is connected by its anterior margin with the broad ligament; by its inner extremity to the uterus by the *ligament of the ovary*, and by its outer end to the fimbriated extremity of the Fallopian tube by a short ligamentous cord.

* For illustration see next page.

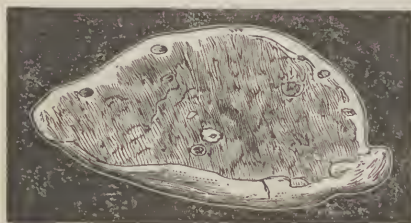
FIG. 8.



THE UTERUS AND APPENDAGES.

In *structure* the ovary is composed of a spongy fibrous parenchyma or stroma, containing a number of small cells traversed by blood vessels, and inclosed in a capsule, one of which, the *external* or *serous*, is derived from the peritoneum; the other, the *internal* or *fibrous*, termed also *tunica albuginea* and *tunica propria*, is analogous to the fibrous coat of the testis. The inner surface of the fibrous tunic blends with the substance of the ovary. The parenchyma is very abundantly supplied with blood vessels. In the meshes of its substance are many small, round, transparent vesicles in different stages of development, which are the *ovisacs* containing the *ova*, and are termed *Graafian vesicles*.

FIG. 9



SECTION OF THE OVARY OF A VIRGIN.

In women who have not borne children, they vary in number from ten to twenty; in size, they vary from that of a pin's head to that of a pea. Some physiologists, however, think, as Dr. M.

BARRY has apparently shown, that numerous microscopic ovisacs exist in the stroma of the ovary, few of which produce ova. The stroma and Graafian vesicles are represented in Fig. 9.

During their early development the Graafian vesicles are deeply seated in the substance of the organ; enlarging as they approach the surface, they form, when mature, small projections on the exterior of the ovary beneath the peritoneum.

Each *Ovisac*, *Follicle*, or *Graafian Vesicle*, consists of an external membrane and fluid contents. The membrane has an external coat, the *tunica fibrosa*, *theca folliculi* of VON BAER, which is highly vascular; and an inner lining, *epithelium*, which consists of polygonal cells with large nuclei, and fatty

granules. After death the cells very soon lose their definition, when the epithelium assumes the appearance which has caused it to be denominated *membrana granulosa*, meaning, a granular layer with numerous nuclei.

The *membrana granulosa* forms a uniform lining to the ovisac, excepting on the side nearest the surface of the ovary, where the cells are accumulated into a small eminence called *cumulus proligerus* or *germinal eminence*.

The *Ovulum* (the future ovum), which is a minute globular nucleated vesicle, is contained in this germinal eminence. The contents of the ovisac, *liquor folliculi*, are a clear yellowish fluid resembling serum, and a few free nuclei detached from the epithelium.

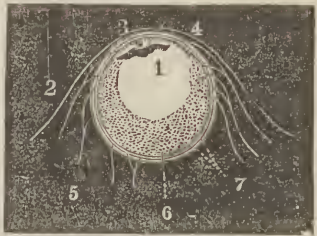
The *Ovum* is exceedingly minute, measuring from one two-hundred-and-fortieth to one one-hundred-and-twentieth of an inch in diameter, consisting externally of a transparent envelope, the *zona pellucida* or *vitelline membrane*, and internally of the yolk or *vitellus*, a small vesicular body, imbedded in the substance of the yolk, is

the *germinal vesicle*, and this contains a minute substance called the *germinal spot*. The germinal vesicle is a fine transparent membrane, about one seven-hundredth of an inch in thickness; the germinal spot is opaque, of a yellow color, and measures one three-thousand-six-hundredth to one two-thousand-four-hundredth of an inch.

The development of the Graafian vesicles and ova continue uninterruptedly from infancy to the end of the fruitful period. The ova are immature and incapable of impregnation before puberty.

The Graafian vessels gradually approach the surface of the ovary, whence the ovum and fluid contents of the vesicles are

FIG. 10.



SECTION OF GRAAFIAN VESICLE.

passed into the Fallopian tube. In most mammalia the maturation and discharge of ova occur at regular periods, which are indicated by a peculiar discharge, or by a hemorrhage from the vagina. In the human female the process of ovulation occurs once in about twenty-eight days, and is usually attended with more or less hemorrhage. This process of ovulation is properly menstruation, although the term menstruation is often erroneously applied to the hemorrhage itself. Sexual desire is always greater in females during the menstrual period, which usually extends through about one-third of each month; and it is only during this period that the female is liable to impregnation. There are many cases, however, in which, from disease or debility of the uterine system, the process of ovulation occupies one-half, and in a few cases two-thirds of the time of each month, rendering the female liable to become pregnant during that length of time.

The *Corpus Luteum* is a small yellowish body perceived in the ovarium after the rupture of a Graafian vesicle and the escape of its ovum. Its existence was formerly, but erroneously, regarded as an evidence of previous pregnancy. A corpus luteum may be found in every follicle from which an ovum has been discharged, but its appearance and the changes it undergoes will be different in cases of impregnation or non-impregnation. The corpus luteum of pregnancy has been termed *true*, while that of the unimpregnated state has been called *false*. The *true corpora lutea* are of large size, often as large as a mulberry, of a rounded form, projecting from the surface of the ovary. The *false corpora lutea* are of small size, do not project from the surface, and do not, in the early period of their existence, contain any central cavity as do the true. The corpora lutea which are independent of pregnancy, disappear in the course of one or two months, leaving scarcely a perceptible trace of their existence, while the true corpora lutea are said to retain their obvious vascular and plicated structure to the second or third month of pregnancy, when they slowly diminish in size, and some months

after parturition are entirely obliterated or reduced to very small whitish or dark-colored masses termed *corpora albicans* *vel nigrum*.

The *Mammary Glands* (*mammæ*) belong to the reproductive system. Their office is to supply the offspring with food in a fluid form, until its teeth are sufficiently developed to enable it to masticate solid aliment. They exist in a rudimentary state in the male, and when excited by peculiar circumstances, have been known to secrete milk. They have sometimes become enlarged after the loss or atrophy of the testicles. They are situated in the pectoral region, corresponding to the interval between the sixth and seventh ribs, and extending from the side of the sternum (breast bone) to the axilla or armpit. They are of small size before puberty, but enlarge as the generative organs become more developed. They increase in size during pregnancy, enlarge rapidly soon after delivery, and become atrophied in old age.

Near and a little below the centre of each mamma, its outer surface presents a small conical prominence, the *mammilla* or *nipple*, which is surrounded by an *areola* having a colored tint. Before impregnation the color is of a crimson or delicate pink; after impregnation it deepens, and assumes a brownish hue, which, after the birth of a child, continues through life. The nipple consists of numerous vessels, which form a kind of erectile tissue, intermixed with muscular fibres.

The areola is provided with *sebaceous glands*, which secrete a substance of a fatty consistence for the protection of the delicate

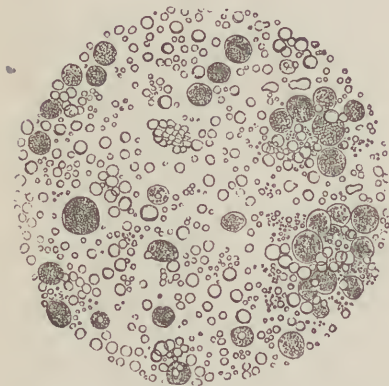
FIG. 11.

SECTION OF MAMMARY
GLAND.1 1, Galactophorous ducts, 2 2,
Lobuli.

integument around the nipple. During the nursing period these glands are greatly enlarged in size, and appear like pimples projecting from the skin.

The mamma is a conglomerate gland composed of *lobes*, *lobules* and *gland vesicles*. The lobes, fifteen to twenty-five in number, have each a separate system of lobules and gland vesicles, and a distinct excretory duct. The lobes are irregular in form and size, and made up of smaller lobes (lobules) and the lobules of other lobules still smaller, the smallest lobules consisting of round or pyriform gland vesicles. The gland vesicles are about one two-hundredth of an inch in diameter; they are constituted of a structureless membrane (*membrana propria*) lined with an *epithelium* of nucleated cells. They communicate with an excretory duct, and the excretory ducts of all the lobules unite to form a common excretory duct for each lobe, the *ductus lactiferous* or *ductus galactophorous*. This duct passes beneath the areola, dilates into an elongated sac

FIG. 12.



MILK.

Milk globules and Colostrum corpuscles, the latter being the largest.

or ampulla, *sacculus* or *sinus lactiferus*, and at the base of the mammilla contracts in size, and bends outward to that process, terminating at its extremity by a small aperture. There are fifteen to twenty-five ducts in the nipple, corresponding with the number of lobes composing the gland.

The *secretion of Milk* is effected by means of the formation of oil globules in the epithelial cells of

the gland vesicles. As the epithelial cells are perfected, they are pushed outward and displaced by a new formation of

similar cells beneath them, and are thus carried forward into the lacteal ducts, where the cell bursts and discharges its oil globules, which have now become *milk globules*, after which the cell-membrane and nucleus disappear. *Milk* is constituted of these milk globules suspended in a fluid, the *milk plasma*. Previously to conception the mammary glands secrete only a yellowish mucus; and at the commencement of lactation the milk is imperfect, or but slightly nutritious, having in its composition a number of cells filled with yellow fat globules, termed *colostrum corpuscles*.

CHAPTER III.

THE ORIGIN OF LIFE.

VITAL AND CHEMICAL ACTIONS.—Organized or living beings are distinguished from the inorganic world by the nature or quality of the actions which they perform. The actions which take place in masses of matter are *mechanical*—mere changes of place. Particles of matter combine and separate, according to innate and reciprocal affinities, constituting *chemical* actions or changes. But in the organic domain all actions are in obedience to *vital* laws, and entirely different from chemical or mechanical changes. *There is no chemistry in living structures.*

In the living system elements are *transformed* and *disintegrated*. The vegetable kingdom transforms simple or primary elements into its own tissues, structures and organs. But the animal kingdom can only employ, in the construction, development and replenishment of its tissues, structures, and organisms (with the exception of atmospheric gases and water) only the proximate elements of the vegetable kingdom. While therefore the vegetable kingdom, so to speak, feeds on the animal kingdom, the animal kingdom, directly or indirectly, feeds on the vegetable kingdom. And this fact, which is but the statement of a law of Nature, points to important considerations in dietetics and agriculture.

It is true that masses of inorganic matter may increase or decrease in bulk; but it is by the accretion or separation of particles. In chemistry, acids and alkalis, for example, combine and form salts—a third substance unlike either of the ingredients, and the salts may be decomposed and the ingredients reproduced. There is nothing like nutrition,

growth, development and disintegration. But living organisms change and transform other elements and substances without being themselves changed. They convert food into bone, muscle, nerve, etc.; use them as force material, reduce them to ashes, and expel the ashes in the form of bile, sweat, fæces, urine and carbonic acid gas, through the emunctories—the liver, skin, bowels, kidneys and lungs. Nothing analogous to these processes occurs in the inorganic world; nor can the chemical laboratory either construct a vital organ or tissue, or analyze it so as to determine of what elements or materials it was composed. The chemist can only give us the product of his analysis, and he only analyzes dead matter.

I had the pleasure of attending the annual meeting of the British Scientific Association at Cambridge, England, in October, 1862. It was then claimed by Professor ODLING that chemistry was constructive as well as destructive; and he delivered a lecture in Guildhall to prove this position. The lecture was fine, and the experiments were brilliant; but all that he said and did proved to my mind just the contrary.

SPONTANEOUS GENERATION.—It has long been a mooted question with physiologists, whether living beings may, under certain circumstances, be produced from inanimate substances, independently of the egg or seed, and hence without parental source. The author of the “Vestiges of Creation” has very clearly traced the development of all living beings from a drop of albumen; and he reasons very logically that all that is required, in order to enable the chemist to construct or create all forms of vital organisms, is the production of a minute quantity of albumen. But there is the essential problem. Chemical manipulations may form substances closely resembling albumen and other organic products, but their productions will for ever lack the indispensable element of vitality. *They will not grow.* The material the chemist can manufacture may exactly resemble, so far as our senses can detect, albumen, or other animal or vegetable substance, and

he may add to its quantity continually. *But it will be dead matter still.* It will never manifest the least disposition to resolve itself into tissues, structures and organs. It may be good *chemical* albumen; but it is only *vital* albumen that can afford the material for organic development; and this, so far as we have evidence, is only produced in the processes of living beings.

Many experiments have been tried with the view of solving the problem of spontaneous generation, and some of them have seemed to determine the question affirmatively. But closer investigation has detected the fallacy of the experiments, and, at present, the great majority of physiologists disbelieve the doctrine.

Grasshoppers, beetles, earthworms, the myriads of insects which swarm over stagnant waters, and the maggots which exist in putrefying flesh, flour paste, excrement, etc., have been regarded as instances of spontaneous generation, produced directly from the earth or atmosphere. But it is now well understood that all of these creatures have a similar parentage to those animals whose natural history has been longer understood. The maggots are hatched from the eggs deposited by certain species of flies, which find, in the decaying material a suitable place for their development. In due time the maggot, if not destroyed, becomes a winged insect like its parent.

INFUSORIA.—Infusorial animalcules have long been regarded as among the strongest arguments in favor of spontaneous generation. If water, holding any organic matter in solution, is exposed to the atmosphere of moderate temperature, it will soon swarm with living organisms, too minute to be visible except by the aid of the microscope. Their forms are exceedingly varied, and are subject to many and rapid changes while growing. EHRENBERG has described more than three hundred varieties. Owing to their presence in watery infusions of animal and vegetable matters, they have been denominated "*infusoria*" or "*infusorial animalcules*."

It is clear that these animalcules must be produced by spontaneous generation, or that their germs must have been introduced through the medium of the atmosphere. We have, however, no direct evidence on either point, no eggs or germs have ever been found. But, since the infusoria are themselves microscopic, their germs, which must be much more diminutive, may have escaped even microscopic observation. It is certain, moreover, that the microscopic germs of animals and plants are wafted about in the atmosphere, and that when they come in contact with any substance which supplies them with the requisite warmth and moisture, they develop into living organisms. Probably in all places near the surface of the earth, except, perhaps, in the extremely frigid regions, the air contains myriads of dust-like particles which are nothing more nor less than eggs or germs of microscopic animals or plants, ready to bring forth infusorial animalcules wherever and whenever they meet with rotting or decomposing organic matter, or come in contact with a stagnant pool of the proper temperature.

The following experiment by SCHULTZE of Berlin, first published in the Edinburgh "New Philosophical Journal" for October, 1837, I copy from DALTON'S Physiology :

"This observer prepared an infusion containing organic substances in solution, and inclosed it in a glass flask of such a size that the infusion filled about one-half the entire capacity of the vessel. The mouth of the flask was fitted with an air-tight stopper provided with two holes, through which were passed narrow glass tubes bent at right angles. To each of these tubes were attached a potash apparatus, similar to those used for condensing carbonic acid in organic analysis. One of these was filled with concentrated sulphuric acid, the other with a solution of caustic potassa. The flask with the organic infusion having been subjected to a boiling temperature in order to destroy any living germs which it might contain, the stopper was inserted, and the whole apparatus exposed to the light, at the ordinary summer temperature. The connections

of the apparatus being perfectly tight, no air could penetrate into the flask, except by passing through either the sulphuric acid or the potassa, either of which would destroy any organic germs which might be suspended in it. Every day a fresh supply of air was introduced into the flask by drawing it through the tube; and in this way the atmospheric air above the infusion was constantly renewed, while at the same time the introduction of living germs from without was effectually prevented.

“SCHULTZE kept this apparatus under his observation, as above, from the last of May till the first day of August; frequently examining the edges of the fluid with a lens, through the sides of the glass jar, but without ever detecting in it any traces of living organisms. At the end of that period the flask was opened, and the fluid which it contained subjected to direct examination, equally without result. It was then exposed, in the same vessel and in the same situation as before, to the free access of atmosphere, and at the end of two or three days it was found to be swarming with infusoria.”

PARASITES.—These are organized bodies which live upon the surface or in the interior of other animal or vegetable organisms. They are nourished either by the fluids of the animal or plant which they inhabit, or they feed upon the contents of their cavities and excretory organs. The *mistletoe* of the oak and other old trees; the *Oidium albicans* which is found on the mucous surface of the mouth; the *Botrytis Bassiana* which attacks the body of the silk worm; many species of *trematoid worms* which are attached to the gills of fish and water lizards, the *Trichina spiralis* which is found in the flesh of man and other animals; the *measles* which always infest the livers, lungs, mesenteric glands, etc., of stall-fed and sty-fed animals; the *scabies* which burrows under the cuticle and induces the malady called the itch; and the various worms of the alimentary canal, are examples.

Each particular species of parasite is found only in a par-

ticular species of animal, and, as a general rule, each inhabits a particular part or organ, or a particular portion of some organ. These facts, however, do not prove that they are all really different animals; the stronger probability seems to be that many of them, in form, shape and size, develop according to the particular structure, vessel, gland or follicle in which they find a permanent lodgment.

But, as most of these parasitic creatures are known to have sexual organs, male and female, and to produce fertile eggs in great abundance, the problem of spontaneity is set for ever at rest, so far as they are concerned. Their prolificness may be partially imagined from the facts that the eggs of a single female *Ascaris* may be counted by thousands, while those of the tapeworm are estimated by millions. Says Professor DALTON'S "Human Physiology," "Now these eggs, in order that they may be hatched and produce new individuals require certain special conditions which are favorable for their development, in the same manner as the seeds of plants require for their germination and growth a certain kind of soil and a certain supply of warmth and moisture. It is accordingly no more surprising that the *Ascaris vermicularis* should inhabit the rectum, and the *Ascaris lumbricoides* the ileum, than that the *Lobelia inflata* shall grow only in dry pastures and the *Lobelia cardinalis* by the side of running brooks. The lichens flourish on the exposed surfaces of rocks and stone walls; while the fungi vegetate in darkness and moisture on the decaying trunks of dead trees."

But the encysted, or *sexless* entozoa, which are found in the interior of the solid tissues and in the substance of the organs, present, at first, a more serious difficulty. The *Trichina spiralis*, for example, which has been found in the substance of the muscles (and to whose presence many cases of fatal typhoid fever have been lately attributed), has no trace of a sexual organization. Nor have the *Cœnurus cerebralis* which is sometimes found in the substance of the brain, and the *Cysticercus cellulosæ*, found in the areolar tissue of various parts of the

body, any appearance of generative organs. But the difficulty vanishes at once when it is understood that, like the maggot (which is also without sexual organs), they are in an embryotic state, and do not have their sexual organs developed until after their metamorphosis into perfect insects.

In the plant, the blossom, which is its sexual apparatus, only appears as the general structure approaches maturity.

The sexless entozoa are the undeveloped young of other parasites, whose development is not only arrested but materially modified by their accidental situation.

The *Cysticercus*, different varieties of which have been found in the liver, peritoneum and areolar tissue, has been shown, by the experiments of KUCHENMEISTER, LIEBOLD and others, to be the young or imperfectly-developed embryo of the *Tania*. The tapeworm grows by a succession of cells or "articulations" downward from the head; and as those most distant from the head become matured, they exhibit a sexual apparatus (ovaries and testicles), which produce eggs in great numbers. These articulations, if removed from the body of the worm, are reproduced from the head; but if the head is removed from the intestine, no further propagation or reproduction of the articulations takes place.

The danger of eating "measly pork," stall-fed beef, or fattened animals of any kind, may be inferred from the following passage in DALTON'S Physiology, (page 538.)

"When the mature articulation of the tapeworm is thrown off from its posterior extremity, the eggs which it incloses have already passed through a certain period of development, so that each one contains an imperfectly-formed embryo. The articulation, containing the eggs and embryos, is then taken, with the food, into the stomach of another animal; the substance of the articulation, together with the external covering of the eggs, is destroyed by digestion, and the embryos are thus set free. They then penetrate through the walls of the stomach into the neighboring organs, or the areolar tissue, and becoming encysted in these situations are there developed

into cystercerci. Afterward, the tissues in which they are contained being devoured by a third animal, the cysticercus passes into the intestines, fixes itself to the mucous membrane, and, by a process of budding, produces the long tape-like series of articulations by which it is finally converted into the full-grown Tænia.

CHAPTER IV.

SEXUAL GENERATION.

NATURE OF SEXUAL GENERATION.—Generation, in both plants and animals, implies the production of a new being, by the commingling of certain elements which are the peculiar products of the sexual apparatus. The female parent contributes the seed, egg or germ-cell, and the male parent furnishes the seminal fluid, spermatozoa or sperm-cell. So far as physiologists have yet been able to trace living organisms to their origin, it appears that all plants and animals which reproduce their kind are endowed with sexual organs corresponding to the ovaries and testicles of human beings. The “fertilization” of the ovum of the female by the semen of the male is commonly understood to be a mere catalysis or contact-action, or as something analogous to a stimulant which *excites* the egg or the seed to grow. But when the rationale of stimulation is properly understood, the fallacy of this idea will be self-evident. There is no more misused or abused word in the language than that of stimulant. It is employed by medical writers in many senses, and frequently in no sense at all. The common idea attached to the term stimulation is synonymous with invigoration or strength; and a stimulant, in the *Materia Medica*, is regarded as an agent which either imparts power to the living organism directly or which excites the system to the performance of functional duty. This doctrine is as erroneous in theory as it is disastrous in practice. All the dissipation and debauchery in the world; all the gluttony and intemperance that have degraded individuals, demoralized societies and ruined nations, are traceable directly or indirectly to this most pernicious fallacy.

And now that I have broached the subject, I must further

digress to say that stimulation is *fever*, and nothing else. A stimulant, in the proper medical sense of the word, is an agent which the living organism resists and expels with that kind, degree and direction of vital action whose manifestations constitute the symptoms of the hot stage of a fever. Locally, the effects of stimulants would be more properly termed *inflammation*; and the inflammation—the disease—will be of an intensity proportioned to the dose or quantity of the poison. If the advocates of the Temperance Reformation could see this subject in its true light, they would place their cause on a very different basis from that which recognizes alcohol as a medicine, while condemning it as a beverage. The subject, however, has been fully discussed in my late works, “The True Temperance Platform,” and “Alcoholic Medication,” to which I refer the reader who is interested in the Total Abstinence cause.

The process of impregnation is more like that of assimilation, which is physiological, than that of stimulation, which is pathological. Indeed, it is as unlike the latter as disease is unlike “the normal play of all the functions.” Nor can I see any philosophical explanation of the fact of the transmission of qualities, except in the theory that the seminal secretion mixes, mingles and becomes actually incorporated with the elements of the ovum, in the production of the new being. What other possible rationale can be offered for the resemblance of offspring to *both parents*, and for the infinitely varied degrees of resemblances to either parent or to both?

THE SEXUAL ORGANS OF PLANTS.*—The flowers of the vegetable kingdom, whose fragrance pleases and whose beauty charms us, are nothing more nor less than the generative apparatus. And the various fruits which afford the animal

* The illustrations on this subject are taken, by the kind permission of the publishers, Messrs. IVISON, PHINNEY, BLAKEMAN & Co., New York, from that excellent work, “Botany for Young People and Common Schools,” by ASA GRAY, M. D., Professor of Natural History in Harvard University.

kingdom and the human family so much substantial food and so many luxuries, are but the seeds which result from sexual congress and subsequent growth, and the pulp in which the seeds are nourished and protected. Some plants, however, do not produce seeds nor flowers. They are called *flowerless plants* (Cryptogamia). But they produce minute bodies termed *spores*, which answer the purpose of seeds. These bodies are of inconceivable minuteness, and in all probability, if our powers of vision, with microscopic assistance, were sufficient, we should be able to discover in them all the elements of the sexual organism which are so apparent in the flowering plants. Phenogamous, or *flowering plants*, produce blossoms and seeds, each seed consisting essentially of an embryo or germ which has only to grow and unfold its parts to become a plant resembling its parent source.

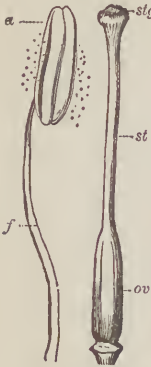
The essential organs of the sexual apparatus of plants are the *stamens* and *pistils*. The stamens are the male organs, and the pistils the female organs. They are in all respects analogous to their corresponding organs in the animal kingdom; and as reproduction from seeds and eggs is governed by the same laws and involves the same vital processes, a brief analysis of the sexual organism of plants can not fail to be interesting and instructive.

The *Stamens* commonly consist of two parts, a *filament* and an *anther*. The filament is the stalk or stem of the stamen; and the anther is the small case or hollow body which surmounts the filament or is attached to its top. The anthers produce a powdery dust-like substance (analogous to the semen) termed *pollen*.

The *Pistils*, which occupy the central part of the flower, generally consist of three parts: the *ovary*, which becomes the seed vessel; the *style*, which is the upward prolongation of the ovary into a slender structure; and the *stigma*, which is the roughish, skinless upper extremity of the style.

In many plants the filament and style are wanting, but the anthers (corresponding to the testes of the male animal), and the ovary and stigma (corresponding to the ovary and vulva of the female animal), are always present.

FIGS. 13 & 14.

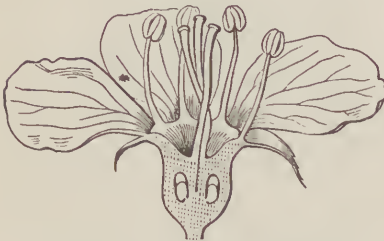
STAMEN AND
PISTIL.

In Fig. 13, *f* is the filament, and *a* the anther discharging its pollen in the form of yellow dust.

In Fig. 14, the ovary (*ov*) is seen at the top of the stalk, the style (*st*) above the ovary, and the stigma (*stg*) at the upper extremity of the style.

The specific function of the stamens and pistils is the fertilization of the seed, which process is accomplished in the following manner. At the proper season, when the sexual organs have arrived at the period of maturity, the anthers discharge their pollen into the air, some of which falls, or is wafted by the wind, upon the stigma, and insinuating itself between the cells of the

FIG. 15.



SECTION OF HAWTHORN BLOSSOM.

mens and three pistils. In the Cherry there is but a single

FIG. 16.



SECTION OF CHERRY BLOSSOM.

organ, passes down the lower areolar structure of the style to the ovary.

Stamens and pistils vary much in number and in arrangement, with regard to the other parts of the flower. In the Hawthorn (Fig. 15) there are four stamens and three pistils. In the Cherry (Fig. 16), while the stamens are numerous. In the case of the Hawthorn, for example, the calyx grows fast to the ovary, and all other parts of the blossom appear to grow on it. In the Cherry, the stamen and petals are on the calyx.

Nor is there less variety in the form and arrangement of the individual stamens and pistils; in this respect again resembling the corresponding organs of the animal kingdom. Fig. 17 is a representation of a pistil of the Stone-crop; its stigma gradually enlarges downward into the ovary, the ovary being divided to show some of the ovules within. Fig. 18 represents one of the ovules, or future seeds, highly magnified.

A grain of pollen, highly magnified, from the anther of a Mallow, is seen in Fig. 19.

It is curious to observe how both stamens and pistils answer to leaves, folded and rolled together. The stalk or filament of a stamen corresponds with the footstalk of a leaf, and the anther answers to the blade. In Fig. 20, the lower portion represents a short filament bearing an anther, which has its upper half cut away and the summit of a leaf above it. Beside this, for comparison, is the whole stamen of a Lilly. The two halves of the anther answer to the halves of the blades of the leaf, one on each side of the midrib; the continuation of the filament which connects the two cells corresponds to the midrib. The anther generally opens along that structure which corresponds to the margins of a leaf.

The structural arrangement and development of the sexual organs of plants, and particularly the fact that both stamens and pistils seem equally to answer to folded leaves, have a curious interest in connection with certain theories which have been entertained with regard to the law of sex; some physiologists supposing all human beings originally sexless, the sex being determined in some unknown manner in the process of growth.

FIG. 17.

PISTIL OF
STONE-CROP.

FIG. 18.

OVULE
MAGNIFIED.

FIG. 19.



POLLEN GRAIN.

Figs. 20 & 21.



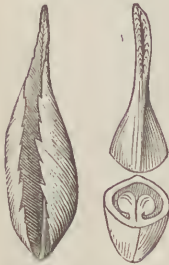
PLAN OF A STAMEN.

Figs. 22 and 23 show how a simple pistil answers to a leaf. A simple pistil, regarded botanically, is made by the folding up inward of the blade of a leaf, the margins coming together and joining so as to constitute a hollow closed sac which is the ovary; its tapering summit forms the style, and some portion of the margins of the leaf in this, destitute of skin, and of irregular rough surface, becomes the stigma. Here the ovules or seeds are attached to what answers to the united margins of the leaf. The particular part to which the ovules are attached is called

the *placenta*.

All the following plants except the Pine family have their ovules and seeds produced in a seed vessel of some sort, and are hence termed

Figs. 22 & 23.



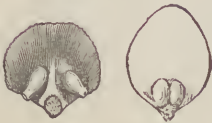
PLAN OF PISTIL.

angiospermous. In Pines, Spruces, Cedars, etc. (*gymnospermous* or *naked-seeded*), the pistil is an open leaf or scale, bearing ovules on its upper or inner surface. "Each scale of a Pine cone is an open pistil, and the ovules, instead of being inclosed in an ovary which forms a pod, are naked, and exposed to the pollen shed by the stamen-bearing flowers which falls

directly upon them.

"Fig. 24 is a view of the upper side of an open pistil or scale from a forming Larch cone at flowering time, showing the two ovules borne on the face of it, one on each side near the bottom. Fig. 25 is the same grown larger, the ovules becoming seeds. When ripe and dry the scales turn back, and the naked seeds peel off and fall away."

Figs. 24 & 25.



PISTIL OF LARCH CONE.

In some classes of plants (the Willow, Poplar, Hemp, etc.) the male and female organs are on separate plants, and in others there are separate male and female flowers on the same plant.

HERMAPHRODISM.—In the snail and tapeworm, and in many of the lower animals, the ovaries and testicles exist in the same individual, which circumstance has caused the term “hermaphrodite” to be applied to them. But, although the generative organs are developed in the same individual, they can not be said to be co-existent in function; for the ovaries first come to maturity and perform their functions, after which the testicles become matured and perform their office. Thus, the individual exercises the two generative functions at different ages; and can not properly be said to be both male and female at the same time.

In man, and in all the higher classes of animals, the male and female genital organs exist in different individuals. All the supposed cases of hermaphrodisim in human beings are merely monstrosities—deformities or deficiencies in one or more parts of the sexual apparatus. There are cases of sexual ambiguity in which it is extremely difficult to decide to which division of the race the person really belongs; but such persons are always incapable of reproduction. An enlarged clitoris in the female, very closely resembling in size and structure the male penis, and a cleft scrotum in the male, somewhat resembling the external portion of the female vulva, are the most common deformities which have been mistaken for a union of the sexes in the same individual.

Many cases are on record in which imperfectly formed and rudimentary male and female sexual organs have been found in the same individual; but in no such case has reproduction ever occurred. It is not difficult to imagine that, if the ova are male and female, as I am strongly inclined to believe, a male and a female ovum, both impregnated at or near the same

time, may, as a consequence of an inflammatory condition, become blended and developed abnormally. I think this theory, or hypothesis, affords at least a rational explanation of all the monstrosities, or *lusus naturæ*, on record. In some cases the ova simply adhere, as in the case of the Siamese twins; in others the sexual organs of only one will be developed with double head, extra extremities, etc.; while in other cases still, the sexual organs of two or more ova are partially developed with the individual structures of only one, modified of course by the abnormal condition, and presenting corresponding peculiarities of the whole bodily organization—"masculine women" and "feminine men."

Probably the most troublesome and complicated case of doubtful sex on record was published in the *New York Journal of Medicine*, for January, 1847, and has been copied into DUNGLISON'S *Physiology*:

"At a warmly contested election in Connecticut, in the spring of 1843, a person named SUYDAM was brought forward as a voter, who was challenged by the opposite party, on the ground that he was more female than male, and that he partook of the attributes of both sexes. On examining him, Dr. WILLIAM JAMES BARRY found the *mons veneris* covered with hair in the usual way; there was an imperforate *penis*, subject to erection, about two inches and a half long. It had a well formed *glans*, with a depression in the usual seat of the orifice of the urethra, and a well defined *prepuce* and *frænum*. The *scrotum* was not more than half the usual size, and was not pendulous. In it, on the right side, was a *testicle* of the size of a common filbert, with a *spermatic cord*. At the root of the corpora cavernosa in the perineum, there was an aperture, through which the urine was discharged, large enough to admit the introduction of an ordinary sized catheter. From these appearances, Dr. BARRY gave it as his opinion that the person was a male citizen, and consequently entitled to vote. This decision was contested by Dr. TICKNOR, who, however, after an examination suggested by Dr. BARRY, admitted that

SUYDAM was a male. He was accordingly allowed to vote, and the party ticket was carried by a majority of one. A few days after the election, Dr. BARRY was informed that SUYDAM had catamenia, and testimony was afforded that he menstruated as regularly, but not as profusely, as most women. Drs. BARRY and TICKNOR now examined him together, with the following results: His height was five feet two inches, hair light colored, complexion fair, chin beardless, temperament decidedly sanguineous, shoulders narrow, hips broad, and in short the figure was in all respects that of a female. The *mammæ* were well developed, with nipples and areolæ. On passing a female catheter into the opening through which the urine, as well as the monthly sanguineous flow, was discharged, the catheter, in place of entering the bladder, passed into a canal similar to the vagina, three or four inches deep, in which the instrument had considerable play. SUYDAM stated that he had erotic desires for the male sex, and his tastes and bodily powers resembled those of the female. It appeared, too, from proper testimony, that the aperture, through which the urine was discharged, was made by the accoucher at the time of birth. Drs. BARRY and TICKNOR had, therefore, to renounce their previously expressed conviction that SUYDAM belonged to the male sex."

It has been a popular belief, entertained also by some members of the medical profession, that when the female offspring of woman are co-twins with males, such female is incapable of reproduction. But this opinion seems to have been positively disproved by Professor SIMPSON, who collected and published the particulars of more than one hundred cases, ten out of every eleven of whom were mothers of children.

It is still believed, however, by many, including Professor SIMPSON, that the cow is an exception, and the only exception to this rule. It is alleged that when she produces twins of the same sex—two males or two females—their sexual organization is complete, and they are capable of propagating;

while, if the twins are of opposite sexes, although the male will be developed into a perfect bull, the female will be sterile. The question can hardly, perhaps, be regarded as settled, and is, therefore, still an interesting subject for further investigation.

CHAPTER V.

PHYSIOLOGY OF MENSTRUATION.

THE MENSTRUAL FLUX.—From the period of *puberty*, which, in this climate, may be reckoned at the age of fifteen in most cases, until the critical age, or “*turn of life*,” which usually occurs at about forty-eight years of age (varying several years according to constitutional vitality and habits of life, as the commencement of *menstruation* varies, one, two, or three or even more years from the same causes), there is, with few exceptions, a periodical discharge of mucus and blood from the vulva. This discharge continues in a great majority of cases, from three to six days, and recurs very nearly once in twenty-eight days, or once in each lunar month, and continues as long as the female is capable of conceiving, or rather, as long as ova are developed. This discharge is termed *menses*, *catamenia*, *flowers*, etc., and the process *menstruation*. Many errors, however, are entertained on this subject. By some physiologists the menstrual flow is regarded as a secretion; and by others as a hemorrhage. The ancients regarded it as an excretion or purifying process, and many absurd and superstitious notions and practices resulted from this erroneous theory. A woman was regarded as “unclean” during menstruation; and among other absurd vagaries of those who adopted this view of the process, a woman was regarded as a *dangerous character* during her “monthly periods.” It was even said that if, at this time, she should sit under an apple tree, all the fruit would be blasted! etc. etc. We need not wonder at the exclusion of woman from “good society” on occasions, and the degradation which necessarily attached to

the sex, because of this mistaken opinion of the nature of the process of menstruation.

MENSTRUATION IS OVULATION.—As we have already seen, when the sexual apparatus is sufficiently developed, a “germ-cell,” egg or ovum, is evolved from its ovarian bed, passed along the channel of the Fallopian tube into the uterine cavity, and, unless impregnated in its course by meeting and mingling with the “sperm-cell” or semen of the male, and fixed upon the wall of the utero-Fallopian canal, it is expelled through the vaginal passage—a process to be repeated monthly.

This process is usually, though not always, attended with a discharge of blood. Menstruation may occur without the discharge of a drop of blood. Many cases are on record in which women are said to have conceived without menstruating. Some women are said to menstruate during pregnancy, and Dr. GOOD (“Study of Medicine”) relates the case of a woman who “menstruated *only* during pregnancy,” thus acting by the “rule of contrary.” Some women are supposed to have menstruation return years after the “critical age,” and very frequently it is stated in some medical journal that some female child menstruates. Women sometimes, while nursing an infant, find themselves pregnant, without having had any appearance of the menstrual flux since the birth of the last child. This happens, in some cases, in three, and in very rare cases, in two months after delivery. At BARNUM’S “Baby Show,” at the American Museum, several years ago, among the “sights” was a little girl not quite three years of age who “regularly menstruated.”

In all of these cases hemorrhage has been mistaken for menstruation. The menstrual blood was long regarded, and still is by some authors, as a secretion. Dr. GOOD, who regards it as a secretion, terms it as “a species of blood thrown off from the common mass.” This is not the manner in which secretions are effected. A secretion is a *formation*, not a mere

separation. And besides, the blood of menstruation does not differ from ordinary venous blood in any essential particular. Its non-coagulability is owing to the partial decomposition it undergoes after being effused from its proper vessels; and the more slowly it is discharged, and the longer it remains in the passages, the more will its coagulability be diminished or destroyed.

Cases of *Menorrhagia*, in which the hemorrhage occurs irregularly, or once in two or three weeks, are often miscalled "*excessive menstruation*." They are cases of hemorrhage as much as is nose-bleeding or hæmoptysis. Indeed, Madame BOVIN of Paris, who had facilities for investigating this subject never enjoyed by her male cotemporaries, has demonstrated conclusively that the catamenia is nothing more nor less than a discharge of ordinary blood.

RATIONALE OF THE MENSES.—Why should there be hemorrhage as an accompaniment or incident of menstruation? A reference to the nature of the process will set this matter in its true light. All organs whose functions are performed periodically—for examples: the ovaries during ovulation, the male organs during coition, the breasts during lactation, and the stomach during digestion—have a special determination of blood and nervous influence to the part, when the function is to be exercised. This is clearly for the purpose of supplying the part with the material requisite for the proper performance of its function. In the case of digestion the increased quantity of blood sent to the stomach is to supply the material more abundantly for the secretion of gastric juice. In sexual congress the blood is specially determined to the organs concerned in secreting the seminal fluid and conveying it within the sexual organism of the female. In lactation the determination of blood to the mammary glands is for the purpose of supplying the parts with the material from which the milk is formed. And in menstruation the special determination of blood and nerve force (which are always coincident) is to

furnish the elements for the evolution of the germ and its nourishment. A certain degree of distension, congestion, plethora or "erethism," is necessary to distend the capillary vessels, so that the fimbriated extremity of the Fallopian tube may grasp more completely the matured ovum, and insure its passage to the uterus; and if the ovum in its passage becomes impregnated and fixed to the walls of any part of the reproductive channel, the unusual quantity of blood, or some portion of it, is needed to supply the elements for its nourishment and growth, and for the development of its appendages—the membranes and placenta. In some cases the blood, after imparting the nutrient materials required, is wholly returned to the general circulation, so that no hemorrhage occurs. But, in most cases, more or less of it is effused into the uterine cavity and expelled *per vaginam*.

QUANTITY OF MENSTRUAL BLOOD.—In civilized society (and to a great extent in uncivilized) the majority of females lose too much blood at the menstrual period. This results from a relaxed state of the vessels consequent on inflammation. Indeed there are few females, except those who suffer from chlorosis or amenorrhœa, who do not have more or less inflammation of the reproductive organs (particularly of the vagina and neck of the uterus), with its necessary concomitants of relaxation and debility, excessive hemorrhage, leucorrhœa, ulceration and displacement. But as this work is not intended to treat more than incidentally of morbid conditions, I must refer the reader who desires full information on the diseases of the sexual organs and their treatment to my works, "Pathology of the Reproductive Organs," and "Uterine Diseases and Displacements." The latter work is illustrated with colored engravings.

Much observation and an extensive correspondence have enabled me to arrive at a general if not a universal rule, with regard to the amount of menstrual blood. It is this: Other circumstances being equal, the less hemorrhage the

better. Women who live a more simple life, and are less enervated by the luxuries and stimulants of artificial society, even though they are exposed to excessive toil, and many hardships and privations, have comparatively few of the sexual disorders common to women all over the civilized world, and they lose comparatively but little blood during menstruation.

The average quantity of menstrual fluid (which is blood largely admixed with mucus), in temperate climates, is reckoned at six to eight ounces. Some women however lose twice that quantity, and others still more. I am of opinion that all beyond two to three ounces must be regarded as abnormal in quantity. Professor C. D. Mergs of Philadelphia, whose experience has been very extensive, states that he has met with many healthy women who never had occasion to employ a napkin; hence the discharge of blood, in their cases, could not have exceeded the above quantity. I have known many similar cases, and some in which hardly an ounce of blood could have been lost; and I have learned the particulars of the cases of a few females, some married and others single, who hardly stain their linen at the menstrual periods. All that is noticeable is a moderate discharge of a sero-mucous fluid for four or five days, with a very slight tinge of color for a day or two. And all of these persons have enjoyed unusually excellent health.

I am satisfied, moreover, that as a general rule, much more blood is lost during parturition than would be the case were women more vigorous and firm in their muscular tissue. I have known several cases in which but a mere trifle of blood was lost—no more, certainly, than is discharged on the average during menstruation—during the delivery of the child and afterbirth, or subsequently. In all of these cases the mothers had an active, vigorous and elastic state of the muscular system, and were more than commonly hygienic in their habits of living. And I have attended one case—an Irish woman of remarkable fineness, firmness, and tone of muscular

tissue, who lost no blood at all during nor after parturition, the discharges producing no distinctly sanguineous stain on the sheets or cloths employed ; nor did the discharges even stain the hands employed in cutting and tying the umbilical cord or removing the afterbirth.

CHAPTER VI.

IMPREGNATION.

SEXUAL COADJUNCTION.—We have seen that throughout the domain of living organisms, impregnation depends on the conjunction and union of certain elements furnished by male and female organs, each of which is equally necessary to the production of the future being. And it requires but a little knowledge of vital properties and conditions, and but a slight acquaintance with human history to enable us to understand that the future being, in all of its bodily, intellectual and moral qualities and powers, and during its whole period of existence, is to a great extent—vastly greater than is commonly appreciated—dependent on the conditions of the sperm-cell, and the germ-cell, furnished respectively by the male and female parent. It is true that correct training, proper education, and favorable surrounding circumstances may enable a frail and imperfectly-organized embryo to become a better adult person than could be a person developed from perfect germs who had been, during the growing period of life, subjected to just the opposite influences. But the principle is clear, and of immense practical importance, that the qualities of the germs must for ever attach to the foetus, the child, the youth, and the adult. Effects, like their causes, are eternal, and this law of the universe imposes a duty on parents which will be more fully considered hereafter.

NATURE OF THE SEMINAL FLUID.—The nature of the secretion furnished by the testes has never been very precisely determined. So far as the chemical analysis of its constituents is concerned, I need only express the opinion that, as chemical

and vital processes are essentially different, chemical analyses can never determine, more than approximately, the actual ingredients of any organized structure or substance. They can only give the results of the process of analysis. Chemistry can only tell us what is left, after the process of analysis has been performed.

A microscopic examination of the semen discovers the existence of numerous minute bodies, which are regarded as the essential agents in the impregnation of the ovum. These bodies have been variously termed *spermatozoa*, *seminal filaments*, *zoosperms*, *seminal animalcules*, and *spermatozoids*. Other minute granulated bodies have been detected by WAGNER and others. They are less numerous than the seminal filaments, and have been distinguished by the term *seminal granules*; and as both elements are suspended in a transparent homogeneous fluid (*liquor seminis*) pure semen is regarded as consisting essentially of seminal animalcules and seminal granules enveloped in a small quantity of fluid.

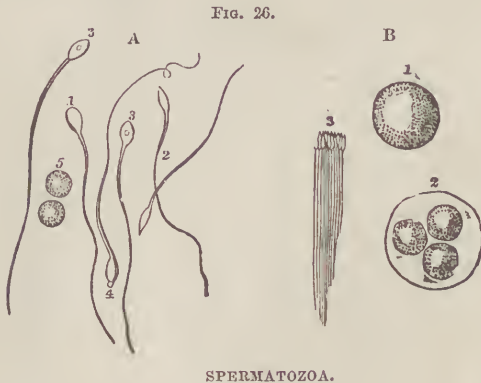


Fig. 26 is a representation of spermatozoa from the human subject and their development. The first group, *A*—1 to 4—shows the variety and character of spermatozoa from the vas deferens; 5, seminal granules. The second group, *B*, is a

representation of the contents of the semen of the testes; 1, large round corpuscle or cell; 2, a cell containing three granular bodies, from which the spermatozoa are developed; 3, a fasciculus of spermatozoa as they are seen grouped together in the testis.

Much discussion has been had, and many microscopic experiments have been made with the view of determining the animality of the caudate bodies called spermatozoa. But the question is still among the controverted problems of physiology. I can not see, reasoning analogically, that they should be regarded as animalcular any more than the ovum should be so regarded, or even the blood corpuscles. The lively motions, queer antics, or desperate combats, which they have been seen to perform, are quite as easily attributable to molecular motion or microscopical delusion as to animality; and the filamentous or caudate form is, perhaps, a necessary result of the channel through which they are projected, the force with which they are propelled, and the fluids with which they are mingled. According to KOLLIKER they are about one six-hundredth of an inch in length.

NATURE OF THE OVUM.—The ancient doctrine that each sex contributed a seminal fluid whose elements, mingling and becoming incorporated into one, constituted the germ of the new being, was not very far from what modern researches have established as true. By changing the phraseology from seminal fluid to sperm-cell and germ-cell, the ancient theory becomes the modern opinion.

The nature of the ovum, like that of the sperm, has been the subject of assiduous investigation and of microscopic analysis. And as the egg of the fowl contains essentially the same parts as the ova in the mammals and in man, it has afforded the most convenient means for studying the elementary properties and constituents of the vitalized germ.

In the egg of the fowl, the yolk membrane and its contents are the essential parts of the germ-cell. The albumen

portion or "white," and the calcareous covering, do not exist in the ovum while it is in the ovary, but are formed during

FIG. 27.

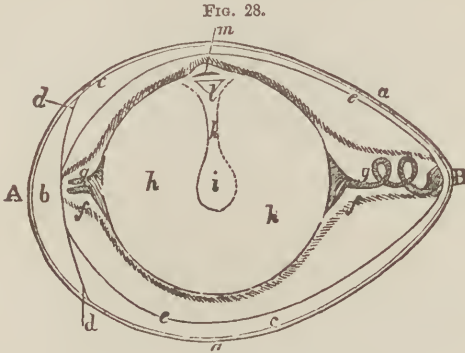


NEW LAID EGG WITH ITS MOLECULE, ETC.

its passage through the oviduct. The yelk—vitellus—consists of albuminous granules and oil globules. Toward the centre the yelk is of a lighter color, and the granules have more the appearance of cells, within which are minute globules. The central portion is termed *discus vitellinus*. Imbedded in the vitellus is a transparent vesicle of a rounded form termed *germinal vesicle*, measuring, in the human subject, one eight-hundredth to one five-hundredth of an inch in diameter; and upon its surface is a dark spot, or nucleus, termed the *germinative spot*. The fully-developed ovum in the human ovary, and of the mammals, does not often exceed one-fifteenth to one-twentieth of a line in diameter. According to BISCHOFF, the ripened ova vary from one two-hundred-and-fortieth to one one-hundred-and-twentieth of an inch in diameter.

In Fig. 28 it will be seen that the germ is always uppermost, and that the yelk floats in the upper portion of the white. *A* is the blunt pole or large extremity; *B*, the "small end" or sharp pole; *a, a*, shell; *b*, space filled with air to supply oxygen; *c*, membrane of the shell, which at *a, d*, divides into two layers; *e, e*, limits of the second and thicker albumen; *f*, limits

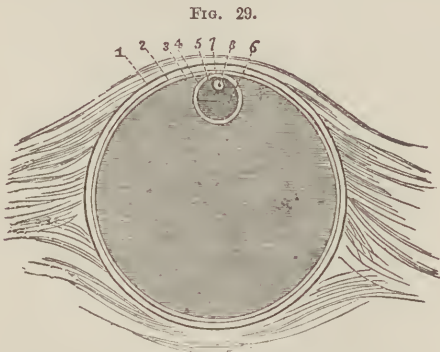
of the third and thickest albumen, the white being in three layers ; *g, g*, chalaze, or ropes of twisted fibres from the yolk,



IDEAL SECTION OF A HEN'S EGG.

which hold it in its place ; *h*, yolk ; *i*, central cavity in the yolk, from which a duct, *k*, leads to the *cicatricula* or "head ;" *l*, cumulus *proligerus*, or germinal cumulus ; *m*, germ or blastos.

Fig. 29 is a representation of a Graafian vesicle, containing

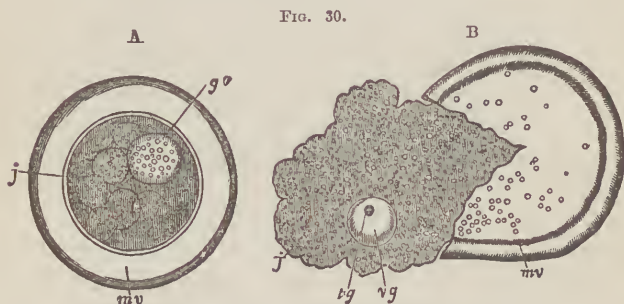


GRAAFIAN VESICLE CONTAINING AN OVUM.

an ovum ; 1, stroma or tissue of the ovary ; 2 and 3, external and internal tunics of the Graafian vesicle ; 4, cavity of the

vesicle; 5, thick tunic of the ovum or yelk-sack; 6, the yelk; 7, the germinal vesicle; 8, the germinal spot.

WAGNER regards the germinal vesicle as a primary cell, of which the germinal spot forms the nucleus, and suggests the term of *germinal nucleus* be substituted for that of germinal spot. It is homologous with the "germ-cell" or "embryonic vesicle" of the vegetable ovule.



CONSTITUENT PARTS OF MAMMALIAN OVUM.

The constitution and arrangements of the different parts of the mammalian ovum are represented in Fig. 30; *A*, the ovum entire; *B*, the ruptured ovum with the contents escaping; *mv*, vitelline membrane; *j*, yelk; *vg*, germinal vesicle; *tg*, germinal spot.

THE SEXUAL ORGASM.—The only conditions requisite for impregnation are the contact of the living sperm-cell with the matured ovum, within the sexual apparatus of the female. The opinion, therefore, generally entertained, and until recently the prevailing doctrine of the medical profession, that a certain degree of pleasurable feeling, at the crisis of the copulative act, constituting the sexual orgasm, is essential to impregnation, is clearly a mistake. It was long held by physiologists that impregnation took place only in the ovary, and that, during the sexual orgasm on the part of the female,

the fimbriated extremity of the Fallopian tube grasped the nearest and most ripened ovum, and releasing or detaching it from its ovarian bed, transferred it to the Fallopian tube. But this theory has been abundantly disproved. It is now known that women who never enjoy pleasure, but, on the contrary, always suffer pain, or experience disgust, because of bodily disease or personal "irrespondence" in the sexual embrace, are quite as prolific as others. Impregnation and conception may occur when the female is insensible from bodily shocks, or stupefied with narcotic drugs, or intoxicated with alcohol, or asphyxiated with chloroform, or violated by forcible means, etc. Indeed, impregnation has occurred, when the seminal fluid, expelled without coitus, has been passed into the vagina by artificial means. It is true that the sexual orgasm on the part of the female is just as normal as on the part of the male. Nor can the maternal parent ever impart or transmit the elements of her whole bodily and mental nature, so fully and so completely as when the orgasm is experienced in its fullest intensity. This is a subject of vast importance, not only to the happiness of married persons, but to the welfare of the human race, and will be treated of hereafter. In this place it is sufficient to remark that the sensibility of the sexual organs is so lost, in many females, in consequence of prolonged chronic disease, or the worse drugs and local appliances which have been employed in medicating them, that pain, indifference or disgust, is all that the woman is capable of experiencing in the act which nature has intended to be the most intensely pleasurable of all the life processes. Many women suffer, and almost uncomplainingly, untold and unutterable miseries in the performance of a function which ought to be attended with unalloyed happiness.

WHERE DOES FECUNDATION OCCUR?—Notwithstanding the researches of many eminent philosophers, and experiments innumerable, extending through a period of hundreds of years, this problem is not yet settled. There is no question

that impregnation *may* occur in the ovary, in the Fallopian tube or in the uterus. But where is the normal locality?

The following experiments, copied substantially from DUNGLISON'S Physiology, are interesting, as presenting a summary of the conflicting opinions and observations on the vexed question. "SPALLANZANI examined frogs with great attention, while in the act of copulation, both in and out of water; and he observed that, at the moment when the female deposits her eggs, the male darts a transparent liquid through a tumid point which issues from its anus. This liquid moistens and fecundates the eggs. To be certain that it is the fecundating agent, he dressed the male in waxed taffeta breeches, when he found that fecundation was prevented, and sperm enough was contained in the breeches to be collected. This he took up by means of a camel's hair pencil, and all the eggs which he touched with it were fecundated. Three grains of the sperm were sufficient to render a pound of water fecundating; and a drop of a solution, which could not contain more than the 2,994,687,500th part of a grain, was enough for the purpose. To diminish the objection, that the frog is too remote in organization from man to admit of any analogical deduction, SPALLANZANI took a spaniel bitch, which had engendered several times, shut her up some time before the period of "heat," and waited until she exhibited evidences of being in that condition, which did not happen until after a fortnight's seclusion. He then injected into the vagina and uterus, by means of a common syringe warmed to one hundred degrees of Fahrenheit, nineteen grains of sperm obtained from a dog. Two days afterward, she ceased to be in heat, and, at the ordinary period, brought forth three young ones, which not only resembled her but the dog from which the sperm had been obtained. This experiment has been repeated by ROSSI and BUFFOLINI, with similar results. The success of an analogous experiment on the human species rests on the authority of JOHN HUNTER. He recommended an individual affected with hypospadias (malformation in the canal of the urethra) to

inject his sperm through a warm syringe. His wife became pregnant.

“In some experiments on generation, MM. PREVEST and DUMAS fecundated artificially the ova of the frog. Having expressed the fluid from several testicles, and diluted it with water, they placed ova in it. These were observed to become tumid and developed; while other ova, placed in common water, merely swelled up, and in a few days became putrid. They observed, moreover, that the mucus, with which the ova are covered in the oviduct, assists in the absorption of the sperm and in conducting it to the surface of the ovum; and that in order to succeed in these artificial fecundations, the sperm must be diluted; if too much concentrated its action is less. They satisfied themselves likewise, that the chief part of the sperm penetrates as far as the ova, as animalcules could be detected moving in the mucus covering their surface, and these animalcules, they conceive, are the active parts of the sperm. It is not, however, universally admitted, that positive contact of sperm with the ovum is indispensable to fecundation. Some physiologists maintain, that the sperm proceeds no further than the upper part of the vagina, whence it is absorbed by the vessels of that canal, and conveyed through the circulation to the ovary. This is, however, the most improbable of all the views that have been indulged on this topic; for if such were the fact, impregnation ought to be effected as easily by injecting sperm into the blood vessels—the female being, at the time, in a state of voluptuous excitement. It has been directly overthrown, too, by the experiments of Dr. BLUNDELL on the rabbit, who found, that when the communication between the vagina and the uterus was cut off, impregnation could not be accomplished, although the animal admitted the male as many as fifty times, and generally at intervals of two or three days or more. Yet it was evident that much of the male fluid had been deposited in the vagina, and absorbed by veins or lymphatics. BISCHOF states that he has frequently extirpated the uterus in rabbits,

leaving the vagina and ovaries with the tubes; and in no case was the animal fecundated after the operation, although it admitted the male freely.

“Others have presumed, that when the sperm is thrown into the vagina, a *halitus* or *aura*—*aura seminis*—escapes from it, makes its way to the ovary, and impregnates an ovum; while others, again, are of opinion, that the sperm is projected into the uterus, and in this cavity undergoes admixture with the germ furnished by the female; and a last class, with more probability, maintain, that the sperm is thrown into the uterus, whence it passes through the Fallopian tube to the ovary, by the fimbriated extremity of the tube embracing at the time the latter organ. The late Dr. DEWEES suggested, that after the sperm is deposited on the labia pudendi, or in the vagina, it may be taken up by a set of vessels—which, he admitted, had never been seen in the human female—whose duty it is to convey it to the ovary. This conjecture, he conceives, had been in part confirmed by the discovery of ducts, leading from the ovary to the vagina, in the cow and sow, by Dr. GURTNER of Copenhagen. The objection that may be urged against his hypothesis, Dr. DEWEES remarks, he must leave to others! We have no doubt that his intimate acquaintance with the subject could have suggested many that are pertinent and cogent. It will be obvious that if we admit the existence of the ducts described by GURTNER, it by no means follows, that they are inservient to the function in question. Independently, too, of the objection, that they have not been met with in the human female, it may be urged that, if we grant their existence, there would seem to be no reason why closure of the os uteri after impregnation, or interruption of the vulvo-uterine canal by division of the vagina, or division of the Fallopian tubes, should prevent subsequent conception. These vessels ought, in both cases, continue to convey sperm to the ovary; and extra-uterine pregnancies or superfœtation ought to be constantly occurring.

“MM. PREVOST and DUMAS are among the most recent writers who maintain that fecundation takes place in the uterus, and the former gentlemen assign the following reasons for their belief. *First*. In their experiments, they always found sperm in the cornua of the uterus, and they conceive it natural that fecundation should be effected only where sperm is. *Secondly*. In animals, whose ova are not fecundated until after they have been laid, fecundation must necessarily be accomplished out of the ovary, and, *Thirdly*. In their experiments on artificial fecundations, they have never been able to fecundate ova taken from the ovary. In reply to the first of these positions it has been properly remarked by M. ADELON that the evidence of MM. PREVOST and DUMAS with regard to the presence of sperm elsewhere than in the uterus is only of a negative character; and that, on the other hand, we have the positive testimony of physiologists in favor of its existence in Fallopian tubes and ovary. HALLER asserts that he found it there; and MM. PREVOST and DUMAS affirm that, on the first day after copulation, sperm was discovered in the cornua of the uterus, and it was not until after the lapse of twenty-five hours that it had attained the summits of the cornua. Once they detected it in the Fallopian tubes; a circumstance which is inexplicable under the view that fecundation is accomplished in the uterus. LEEUENHOEK and HARTSOKER, also, found it in some cases in the Fallopian tube; and BISCHOFF, WAGNER, and Dr. M. BARRY, discovered spermatozoids in the fluid collected from the surface of the ovary, and within the capsular prolongations of the Fallopian tubes that inclose the ovaria. Still more recently, Dr. BARRY, in two cases, found spermatozoids within an ovum of the rabbit taken from the Fallopian tube. They were within the thick transparent membrane—*zona pellucida*—brought with the ovum from the ovary. M. POUCHET, however, while he gives delineations of spermatozoids found in the middle of the Fallopian tubes of a rabbit on the surface of an ovum fifteen hours after copulation, denies that in the mammalia the sperm

can ascend to the ovary. The contractions of the tubes their ciliary movements; the capillarity of the ducts, and the impassable mucus, he regards as invincible impediments; and maintains categorically—or, to employ the language of M. RACIBORSKI, cited by M. POUCHET, himself, ‘with a vigor and energy of dialectics hitherto unused in science,’ that ‘even if it could reach the germiferous organ, it assuredly could not traverse the thick coats, which protect the ovules and arrive at them.’ He believes, moreover, that observers must have taken for spermatozoids on the ovary, certain moving bodies, which he calls *pseudo-zoospermes*, and which, he says, can only be either microscopic entozoa, or the extremities of certain of the digitations, which form the extremity of the Fallopian tube—more probably the latter. He admits, however, that it seems to be almost certain, that these *pseudo-zoospermes* are exactly the same bodies as were seen by M. DONNE on the nasal mucous membrane of a man. M. DONNE observed epithelial shreds of this membrane separate spontaneously into minute conical portions, each of which had its own movement, like that of the spermatozoids; and we have elsewhere shown—contrary to the opinion of M. POUCHET—that the spermatozoids themselves are not perhaps entitled to any higher rank than that of ciliated epithelial cells.

“In reply to the second argument, it may be remarked, that analogies drawn from inferior animals are frequently loose and unsatisfactory; and ought, consequently, to be received with caution. This is peculiarly one of those cases; for fecundation, in many animals, is always accomplished *out* of the body; and analogy might with equal propriety be invoked to prove, that in the human female the same thing must occur. Moreover, in certain oviparous animals—as in the common fowl—a single intercourse with the male may fecundate all the eggs she may lay in a season. In answer to the third negative position of MM. PREVOST and DUMAS, the positive experiments of SPALLANZANI may be cited, who succeeded in producing fecundation in ova that had been previously separated from the ovary.”

The foregoing summary of contradictory experiments, conflicting opinions, and diverse speculations, sufficiently exhibits the confusion in which the whole subject is involved.

DUNGLISON deduces the conclusion from the facts before mentioned, that conception, *as a rule*, takes place in the ovary; and he adduces ovarian pregnancy as a proof of it. And Professor BEDFORD ("Principles and Practice of Obstetrics") regards the experiments of NUCK and HAIGHTON, as quite conclusive that the contact between the germ-cells and sperm-cells takes place in the ovary. NUCK ligated the Fallopian tube soon after copulation (in a bitch), and, killing the animal some time afterward, found that fecundation had occurred, and that the development of the ovum was going on in the ovarian extremity of the tube; and HAIGHTON, on tying the tube in rabbits, ascertained that fecundation had not taken place on that side in which the ligature had been applied.

Fig. 31 is a representation of extra-uterine pregnancy, the

FIG. 31.



TUBAL PREGNANCY.

foetus developing in the ovarian extremity of the Fallopian tube.

Professor DALTON ("Treatise on Human Physiology") disposes of this vexed question with a single paragraph. "The egg, immediately upon its discharge from the ovary, is ready for impregnation. If sexual intercourse happen to take place about that time, the egg and the spermatic fluid meet in some part of the female generative passages, and fecunda-

tion is accomplished. It appears from various observations of BISCHOFF, COSTE, and others, that this contact may take place between the egg and the sperm, either in the uterus or any part of the Fallopian tubes, or even upon the surface of the ovary. If, on the other hand, coitus do not take place, the egg passes down to the uterus unimpregnated, loses its vitality after a short time, and is finally carried away with the uterine secretions."

CARPENTER ("Principles of Human Physiology") involves this obscure subject in still deeper obscurity by the following paragraph: "Since the discharge of the matured ova from the ovaries takes place as independently of sexual intercourse in the human female (and in the mammalia generally) as it does in those animals whose ova are fertilized out of the body, it seems unnecessary that the seminal fluid should reach the ovarium in order to effect the fertilization of the ova, since this end may be answered by the contact of the two in the Fallopian tubes, or even in the uterus itself. From the experiments of BISCHOFF, however, it appears that in rabbits, bitches, and probably in most other mammalia, sexual union usually takes place previously to the escape of the ova from the ovary, and that sufficient time often elapses for the seminal fluid to reach the ovary before their extrusion occurs;" in such cases, therefore, it would seem probable that fecundation is effected at the ovary itself. That such occasionally happens in the human female seems to be unequivocally proven by the occurrence of tubal or even of ovarian foetation; the ovum having received the fertilizing influence immediately on quitting the ovisac, or even before it has entirely extricated itself from the ovary, and having been in some way checked in its transit toward the uterus, so that its development has taken place at the spot at which it has been arrested. It is affirmed by BISCHOFF that by the time the ovum reaches the uterus, or even the lower end of the Fallopian tube, its capacity for impregnation is lost; but this assertion chiefly rests on the cessation of sexual desire, observed in those animals in which

after death the ova were found in those situations. There is every reason to believe that this is not the case in the human female; for although the sexual desire may be the strongest about the period of the maturation and escape of the ova, yet it is by no means wanting at other times; and the occasional occurrence of cases in which impregnation has taken place from a single coitus in the middle of the interval between the menstrual period, shows either that the ovum may retain its capacity for impregnation for some time after its escape from the ovary, or that its maturation and extension are not by any means invariably coincident with the menstrual period."

If we admit that impregnation in the human female commonly and normally takes place in the ovary, the manner in which the spermatozoa find their way there, is quite as difficult a problem to solve as the one immediately before us, and involves as many discordant theories. I shall, however, consider this subject further in another place.

THE CORPORA LUTEA.—The development of ovarian vesicles commences at a very early period of life. In all animals they are manifested soon after birth, and in some they can be detected almost as soon as the ovaries are evolved. They exist in the human foetus. The Graafian vesicle or ovisac is formed previously to the ovum, which is developed in its interior; and a continual change, in which ovisacs necessarily mature and perish, seems to be going on among the contents of the ovarium, during the greater part of the period of life. According to the observations of Dr. RITCHIE the continual rupture of ovisacs and discharge of ova, at the surface of the ovarium, occurs in childhood; at the period of puberty become exceedingly multiplied, and are so inconceivably minute that Dr. BARRY has calculated a cubic inch of the stroma of the organ to contain two hundred million of them. The extreme minuteness of these microscopic bodies may, however, suggest a doubt whether they are really ovisacs, or mere rudimentary cells very closely resembling ovisacs.

FIG. 32.



OVARIUM OF A
RABBIT.

Fig. 32 is a representation of the ovarium of the rabbit, at the period of heat, showing ova in various stages of development and extension.

Fig. 33 is representation of the ovarium of a living hen. The organ is of the natural size, and the ova are seen in various stages of evolution.

The different conditions and appearances of the ova, in their various stages of progress toward maturation, can be advantageously studied in the ovary or yolk-bag of the common fowl. The blood vessels—arteries and veins—of the ovaries belong to the spermatic. The arteries pass between the layers of the broad ligament to the ovarium, where they have a beautiful convoluted arrangement, similar to the convolutions of the arteries of

the testes. They traverse the ovary in parallel lines forming minute branches or twigs, which have an irregular knotty appearance, resulting from their tortuous course. They are mainly distributed to the Graafian vesicles.

The nerves of the ovaries, which are abundant and extremely delicate, are derived from the renal plexuses. Their lymphatics communicate with those of the kidneys.

DUNGLISON remarks ("Human Physiology," vol. 2, page 399): "It was elsewhere remarked that the formation of the ovule by the Graafian follicle must be regarded as a true secretion—the yolk of which it is mainly composed, as well as the membrana granulosa essentially resembling each other in histological and chemical character. When matured, the ovum, pressed forward probably by fresh depositions of the yellow matter which goes to the formation of the granular membrane and the yolk, is discharged from the ovary, and laid hold of by the Fallopian tube, which acts as an excretory duct, and conveys it into the interior of the uterus."

It ought to be known to physiologists that there is no analogy whatever between a secretion, which is a product of vital action, and a chemical combination. An ovum can no more have a chemical character than a crystal of Epsom salts can have a vital character. Our physiologists will always waste a great portion of their time which is devoted to the investigation of the problems of life, until their minds are entirely

FIG. 33.



OVARIVM OF A HEN.

dispossessed of the idea that there is any chemistry or any thing analagous to it, in living structures. They might as well talk of making eggs in a chemical laboratory, as to talk of chemical action in a vital organism.

Fig. 34 is a representation of the human ovarium laid

open, with Graafian vesicles in various stages of evolution. At *p*, is shown the expanded fimbria of the Fallopian tube, near which is seen to project from the surface of the ovary or Graafian vesicle, *v*, the rupture of which has allowed an ovule, *o*, surrounded by its *discus proligerous*, *c*, to escape. In the centre of the upper part of the pit is seen an emptied Graafian vesicle, *v*, laid open by the incision, and showing

FIG. 34.



HUMAN OVARIVM.

the irregular cavity, *g*. Further up toward the left is shown another Graafian vesicle, with the ovum, *o*, not yet discharged. Other Graafian vesicles *vvv*, in earlier stages of development, are seen in different parts of the figure.

FIG. 35.



CELLS FORMING THE CORPUS LUTEUM.

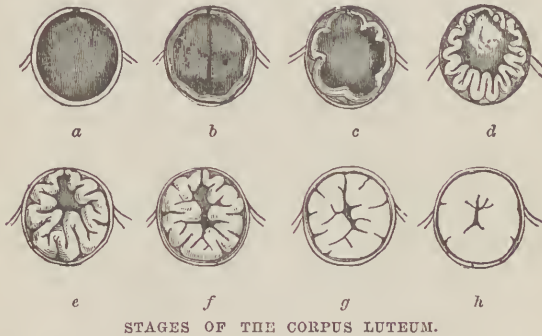
Before the rupture of the ovisac it undergoes material changes. Its walls become more vascular externally, and are thickened internally by the deposit of a fleshy-looking substance, which consists of an aggregation of cells, as represented in Fig. 35.

After the ovum has been matured and discharged, the Graafian vesicle gradually becomes atrophied and obliterated. In one stage of this process of retrogression it is converted into a solid globular body termed the *corpus luteum* (yellow body). Its existence was formerly regarded as an evidence that impregnation had taken place; but is now known to exist in virgins who have menstruated normally, and to be a consequence of ovulation simply. There is, however, such an altered appearance in this substance, in the cases where pregnancy has occurred, that we have to consider the corpora lutea as they appertain, respectively, to the non-pregnant and to the pregnant states, which have sometimes been contra-distinguished as the *false* and the *true* corpora lutea.

THE CORPUS LUTEUM OF MENSTRUATION.—When the Graafian vesicle discharges its ovum at the menstrual period, the cavity is filled with blood, which soon coagulates, the coagulum being retained in the interior of the vesicle. This coagulum or clot gradually becomes contracted and hardened from the absorption of its serum (as is the case with blood when extravasated within any part of the living body); the coloring matter undergoes the changes usual in such circumstances, and, with the serum, is partially removed by absorption, at the same time the membrane of the vesicle becomes hypertrophied and convoluted, by which it tends partially to fill the cavity. This process of enlargement of the membrane of the vesicle con-

tinues for about three weeks, at which time the ruptured vesicle has become so solidified that it receives the name of *corpus luteum*. It may then be felt as a rounded prominence on the surface of the ovary, measuring half an inch in thickness, and about three-quarters of an inch in length. On its surface is a very small scar or cicatrix, occupying the spot of the original rupture.

FIG. 36.



STAGES OF THE CORPUS LUTEUM.

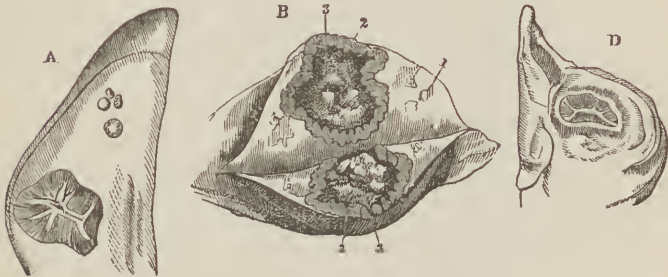
Fig. 36 is a representation of the successive stages of the formation of the corpus luteum in the Graafian follicle of the sow, as seen in vertical section. At *a* is shown the state of the follicle immediately after the expulsion of the ovum, its cavity being filled with blood, and no ostensible increase of the epithelial lining having yet taken place; at *b*, a thickening of this lining has become apparent; at *c*, it begins to present folds which are deepened at *d*, and the clot of blood is absorbed *pari passu*, and at the same time decolorized; a continuance of the same process as shown at *e*, *f*, *g*, *h*, forms the corpus luteum, with its stellate cicatrix.

After the third week, the corpus luteum diminishes in size, and at the end of the fourth week it is reduced to three-eighths of an inch in its longest diameter, and at this time, the entire body may be extracted from its ovarian bed. As the process of retrogression goes on, its rosy, or dull-yellowish hue,

changes to a brighter yellow ; its surface becomes confounded with the central coagulum and surrounding tissues, and, at the end of about two months, it is reduced to a small yellowish spot or scar, and this disappears entirely in seven or eight months. The ovaries of a healthy female, who has menstruated regularly, but in whom pregnancy has never occurred, will often exhibit several corpora lutea in different stages of development and retrogradation.

THE CORPUS LUTEUM OF PREGNANCY.—When impregnation has taken place, the corpus luteum seldom attains a size greater than that of a small pea, and is generally even smaller ; and it begins to diminish about the time for the next menstrual period. The difference between the false and the true corpora lutea, is merely one of rapidity of development and decay ; that of pregnancy going through the same changes, but more slowly ; hence it attains a larger size, a firmer organization, and disappears at a much later period. As pregnancy arrests the process of ovulation, no more ova are matured until after the period of gestation has been completed. Hence, in advanced pregnancy, the corpus luteum is not like

FIG. 37.



CORPORA LUTEA OF PREGNANCY.

that of menstruation, accompanied with unruptured vesicles in active process of development. After parturition, it diminishes rapidly, though its characteristic structure may be distinguished for months afterward.

Fig. 37 is a representation of the corpora lutea of pregnancy of different periods. B, Corpus luteum of about the sixth week after impregnation, showing its plicated form at that period. 1, Substance of the ovary. 2, Substance of the corpus luteum. 3, A grayish coagulum in its cavity. A, Corpus luteum two days after delivery. D, Corpus luteum in the twelfth week after delivery.

In twin pregnancies, and in the cases of triplets, etc., there are corpora lutea corresponding in number to that of the fœtuses, all of which are precisely similar to each other. But, in some cases, a single fœtus is found in the uterus, while the ovaries contain two corpora lutea of similar appearance, one of which is supposed to belong to an embryo which was blighted in the early stage of pregnancy.

Dr. MONTGOMERY gives seven characteristics by which to distinguish the false or virgin corpora lutea from the true, or those of pregnancy.

1. There is no prominence or enlargement of the ovary over them. (This, however, is denied by CARPENTER.)
2. The external cicatrix is almost always wanting. (This is controverted by DALTON.)
3. There are often several of them found in both ovaries.
4. They present no trace of vessels, and can not be injected. (DALTON declares that in both classes of corpora lutea the substance of the convoluted wall is non-vascular, while in both classes vessels exist in the interstices of the folds.)
5. Their texture is sometimes so infirm that it seems to be merely the remains of a coagulum. To be a "distinguishing characteristic," this should be so *always*, or at least *generally*, instead of "sometimes;" and this is undoubtedly the fact.
6. In figure they are triangular or square.
7. They never present either the central cavity, or the radiated or stelliform white lines which result from its closure. (DALTON declares that the very opposite is *always* the fact.)

Undoubtedly the table presented by Professor DALTON gives the most reliable data on this subject—a subject which he has carefully and ably investigated.

	CORPUS LUTEUM OF MENSTRUATION.	CORPUS LUTEUM OF PREG- NANCY.
At the end of three weeks,	Three-quarters of an inch in diameter; cen- tral clot reddish; con- voluted wall pale.	
One month,	Smaller; convoluted wall light yellow; clot still reddish.	Larger; convoluted wall light yellow; clot still red- dish.
Two months,	Reduced to the con- dition of an insignifi- cant cicatrix.	Seven-eighths of an inch in diameter; convoluted wall bright yellow; clot perfectly decolorized.
Six months,	Absent.	Still as large as at the end of the second month; clot fibrinous; convoluted wall pale.
Nine months,	Absent.	One-half an inch in diam- eter; central clot converted into a radiating cicatrix; the external wall tolerably thick and convoluted, but without any bright yellow color.

CHAPTER VII.

PREGNANCY.

CONCEPTION.—Impregnation is not conception. The ovum may be fecundated, by intermixing with the elements of the sperm-cell, without pregnancy resulting. We have seen that wherever, in the generative passages of the female, the living spermatozoa come in contact with ripened ova, then impregnation occurs. But the impregnated ovum may be, nevertheless, expelled, as in the ordinary monthly process of ovulation. Many cases of sterility are attributable to the inability of the uterus to retain the ovum after its impregnation, in consequence of weakness, relaxation, leucorrhœa, etc. Violent exertions will also frequently excite uterine contractions sufficiently to occasion its expulsion, hours and even days after impregnation. If, however, the impregnated ovum becomes *attached* to the walls of the genital channel, the process of foetal development will then and there commence. This attachment or *fixation is conception*. How soon this fixation occurs after impregnation is a problem not very well settled. Doubtless the time varies much with different females, as do all the functional processes concerned in menstruation or pregnancy. I have been collecting data bearing on this point for years, but can not yet regard them as conclusive; and there is no problem in sexual physiology respecting which the facts are more confused and contradictory. That this attachment or fixation may and does occasionally take place in the Fallopian tube, and even in the ovary, is proved by the cases of extra-uterine pregnancy which are recorded. But that the uterus is the place for normal conception is my full conviction, the reasons for which will be considered hereafter.

SIGNS OF PREGNANCY.—The *suppression of the menstrual hemorrhage* is ordinarily the first well-marked sign that pregnancy has occurred. But this is merely presumptive, as pregnancy may occur with females who have never bled at the menstrual periods, and the monthly hemorrhage may continue during the whole period of pregnancy. Dr. Good relates the case of a woman who “menstruated only during pregnancy”—mistaking hemorrhage for menstruation. The cases, however, in which pregnancy is not attended with a suppression of the catamenial flux are very rare, so that we need not be surprised that this even has long been regarded as an unerring symptom.

Nausea and *vomiting*, with *capricious or depraved appetite*, are among the usual symptoms of early pregnancy; but they are occasionally entirely absent; and when present, they seem to depend much more on the morbid conditions or erroneous dietetic habits of the patient than on the incident of pregnancy. Dr. BEDFORD, who sometimes confounds pathology and physiology, regards vomiting “as among the most constant accompaniments of pregnancy, and its relation to this, as a general rule, is based on sound physiology.” We have known several cases in which women went through gestation without a moment’s disturbance of the stomach; and I am of the opinion that if all women would live as hygienically as they did, few or none of them would be troubled with this “sign of pregnancy.”

Salivation, or a copious excretion from the salivary glands, affects some women during pregnancy, but as a sign of pregnancy it is to be regarded as an exception rather than the rule.

Enlargement of the Breasts is a more uniform and reliable symptom. The mammæ, very soon after conception, usually become more hard and movable, with a prickling sensation, while the nipple is more prominent and frequently somewhat painful or tender. The veins of the breast enlarge. These changes may occur in two or three weeks, or not until two or

three months after conception. The general rule is, the more healthy and vigorous the woman, the sooner will they be manifested. As the breasts enlarge, the areola around the nipple becomes of a darker color, with a development of small prominences or follicles. These are among the most reliable evidences of pregnancy, yet they are not infallible. I have known cases in which they occurred a few weeks after a suppressed menstruation. There are cases, also, in which the breasts evince no change whatever till near the period of parturition.

Milk in the Breasts is one of the common accompaniments of pregnancy; but the secretion of this fluid takes place in many conditions of the system when pregnancy does not exist. The facts are well authenticated that milk has been found in the mammary glands of young virgins, and in their analogues of the male sex. Irritation of the breasts, and ovarian diseases, have occasioned the secretion of milk in non-pregnant females.

Enlargement of the abdomen is apparent in the third month of pregnancy, but a similar appearance may result from dropsy. When the uterus begins to increase in bulk, and sinks down a little in the pelvic cavity, it occasions, in most cases, some degree of tenesmus, with frequent urination, and causing the abdomen to appear a little flattened in the hypogastric region.

Œdema of the lower extremities frequently accompanies pregnancy, and is usually attributed to obstruction in the venous circulation, from pressure of the impregnated uterus; but the essential, though more remote cause, is undoubtedly general plethora or local constipation. It rarely troubles those whose regimen is reasonably hygienic.

Quickening, which occurs about the middle term of pregnancy, but may occur two or three weeks earlier or later, is commonly regarded as conclusive of the fact of pregnancy, but even this may be deceptive. The term is applied to the first consciousness of motion in the uterus on the part of the

mother; but spasmodic contractions may produce a similar sensation. In *true quickening*, the motions of the foetus are for the first time recognized. The ancient doctrine was that, at this period, the foetus was endowed with life, and many absurd statutes in relation to willful abortion have been predicated on this erroneous notion. The child has organic life progressively developing in structural arrangements from the moment of conception to that of parturition, although it has no volition, *no mental or soul life*, until its lungs are expanded and "God breathes into its nostrils the breath of life." Then its organs of external relation come into play, and it begins to ascertain its relation to external objects and to other beings.

Although pregnancy may exist with none of the above-mentioned signs or symptoms, or with all of them, the cases in which the woman mistakes her condition in this respect are comparatively few; and in cases where it is important that all doubt shall be removed, recourse must be had to examination *per vaginam*, for the manner of conducting which I must refer the reader to the works on Obstetrics.

DURATION OF PREGNANCY.—That the period of human utero-gestation is, in a majority of cases, about nine calendar months, all are agreed. But there is much discrepancy of opinion with regard to the limit of the deviations from this period. This difference is owing, to some extent, no doubt, to the difficulty of fixing the exact time of conception. It is certainly impossible to determine how much beyond the ordinary or normal period gestation may extend in a given case. But it is safe to say that it seldom varies many days from thirty-nine or forty weeks. According to the French code, the legitimacy of a child born three hundred days after the dissolution of marriage, may be contested; but many authors think this period too limited. In the celebrated Gardner Peerage cause, referred to in most of the works on Medical Jurisprudence, the London physicians disagreed very greatly, as physicians usually do in medico-legal cases. While five

of them maintained that the period of gestation in woman was limited to two hundred and eighty days, twelve of them were of opinion that it might be protracted to three hundred and eleven days. The University of Heidelberg allowed the legitimacy of a child born thirteen months after the date of the last intercourse; and the Supreme Court of Friesland decided in favor of the legitimacy of a child born three hundred and three days after the husband's death. These may be examples of judicial philanthropy, but here, as everywhere where there is a doubt, the accused party is entitled to the benefit of it.

In Pennsylvania two cases of gestation—one protracted to three hundred and thirteen and the other to three hundred and seventeen days have been admitted as legitimate. This decision, however, though it determined the legal action in their cases, does not settle the scientific problem.

VIABILITY OF THE CHILD.—The earliest period at which it is capable of carrying on an independent existence, is involved in the same uncertainty as is the extreme limit of the period of utero-gestation. It is often an important question in medico-legal investigations, yet never admits of positive demonstration. The period generally assigned is the end of the seventh month; and this is quite correct as a general rule, but there are many exceptions. Cases are recorded on good authority in which children have lived for weeks and months, and in some instances have been reared to adult age, who were born at or near the end of the sixth month.

THE DECIDUA.—Soon after conception occurs, a flocculent exudation covers the inner surface of the uterus, constituting, in a few days thereafter, a soft pulpy membrane termed the *decidua*. Whether this decidua is a changed condition—a special development—of the mucous membrane, or a new formation, is a point yet in dispute. Many reasons, however, concur to convince me that the latter theory is the correct one.

Some authors suppose that the mucous membrane of the uterus is actually "cast off" and expelled at each monthly period, with the non-impregnated ovum. And this supposed cast-off mucous membrane has received the name of *false decidua*, in contradistinction to the true decidua of pregnancy. But this is, I think, mistaking pathology for physiology—a mistake, by the way, not very rare in medical writings. An abnormal or morbid *excretion* has been mistaken for a normal or formative *secretion*. I can find no evidence that this false decidua has any existence in females who are in good health, and whose menstruation is, consequently, normal. In my judgment it is a product of inflammation, analogous to that which occurs in croup, diphtheria, tubular diarrhoea, and catarrh of the bladder. In cases of dysmenorrhœa, a similar inflammation and excretion have been called uterine catarrh. In all of these cases the mucous membrane is in a state of chronic inflammation, and exudes or excretes (not secretes) with other impurities or effete matters, a fibrinous material—a kind of vitiated coagulable lymph—which, concreting and hardening, becomes a preternatural membranous covering. Sooner or later it is "cast off" and expelled by the process of sloughing, precisely as happens on all mucous surfaces under similar conditions of disease. Sometimes this false membrane is cast off from the whole inner surface of the uterus, in the form of an entire sac or cyst containing a viscid fluid (which has been mistaken for abortion); but more frequently it is expelled in fragments of greater or less consistency and tenacity. Females who suffer severely of that form of menses, termed dysmenorrhœa, or painful menstruation, expel this membranous matter from the uterus at each menstrual period. The pains attending the uterine efforts in the expulsion of this abnormal product are frequently agonizing, far exceeding in intensity the severest pains of ordinary labor at full term.

The case observed and described by VON BAER (Fig. 38) strikingly corroborates the opinion that the decidua, though projected from the surface of the mucous membrane of the

FIG. 38.



DECIDUA UTERI.

uterus, is not the mucous membrane itself. In the cut the dark shade, over and between the villi, represents the decidua. The uterino vessels are seen extending into the decidua and forming loops there. The cut is a representation of the decidua very soon after conception, when it was in a pulpy state; the villi of the mucous membrane of the uterus which, in the non-pregnant state are very short, were found remarkably elongated, while over them extended an effused substance, not yet organized, but evidently the incipient decidua.

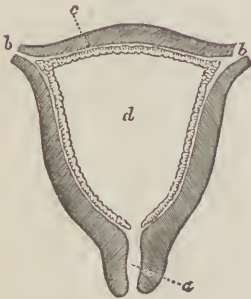
The arrangement and structure of the decidua have not yet been fully determined by anatomists. Some of those who entertain the opinion that impregnation takes place, normally, in the ovary, believe that the decidua is formed prior to the arrival of the ovum in the uterus, and that the ovum on passing into the uterino cavity becomes involved in the secretion (which covers the surface of the uterus), and absorbs a portion of it for nutrient material, while the remainder is organized into a double membrane—one corresponding to the uterus, the other adhering to the ovum. When, therefore, according to this view, the ovum reached the cornua of the uterus, it pushes the decidua before it, the projecting portion constituting the *tunica decidua reflexa*, which envelops the whole ovum except the part where the decidua is detached from the uterus, which is the seat of the future placenta. MM. VELPEAU, WAGNER, PAYET, KIRKES and others adopt this view. But other authors of equal reputation, after diligent investigation, have concluded that it is impossible for so small a body as the ovum to perform so difficult a task.

Fig. 39 is a section of the uterus about eight days after impregnation, its cavity surrounded by the exudation which constitutes the incipient decidua: *a* is the cervix or neck of the uterus; *b b*, orifices of the Fallopian tubes; *c*, decidua vera; *d*, cavity of the uterus.

Fig. 40 represents a section of the uterus just after the

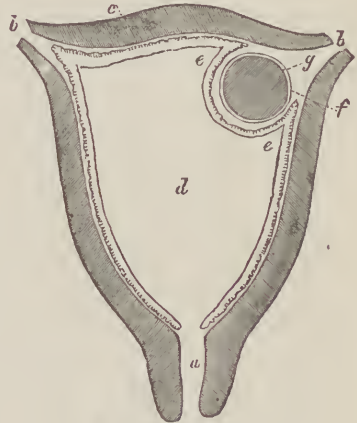
ovum has entered its cavity : *f*, ovum surrounded by its chorion, *g*; *a*, cervix; *b b*, Fallopian tubes; *e*, decidua vera; *d*, cavity of the uterus; *e*, decidua reflexa.

FIG. 39.



UTERINE CAVITY.

FIG. 40.



OVUM ENTERING THE UTERUS.

Professor SHARPEY, with Dr. WILLIAM HUNTER, regards the structures of the decidua and the decidua reflexa as different; and he considers the decidua vera as a new production, the development of which is simultaneous with that of the ovum. At the point of supposed reflection there is found a substance precisely similar to the decidua reflexa, which attaches the ovum to the side of the uterus; this has been termed the *decidua serotina*. It is represented in Fig. 41.

Professor DALTON regards the *decidua* as the “uterine mucous membrane, developed and hypertrophied,” which “becomes exfoliated and thrown off at the same time that the egg itself is finally discharged.” Perhaps this opinion has been the result of confounding the “floeculent exudation” with the *excretion* which takes place in eroup and similar diseases. The “exudation” of the mucous membrane of the impregnated uterus is probably a *true secretion*. It is true

that M. VELPEAU speaks of the decidua as a “*product of excretion* ;” but it seems to me to be a rule and a law, without any exception, that all *formative* products from the blood are *secretions*.

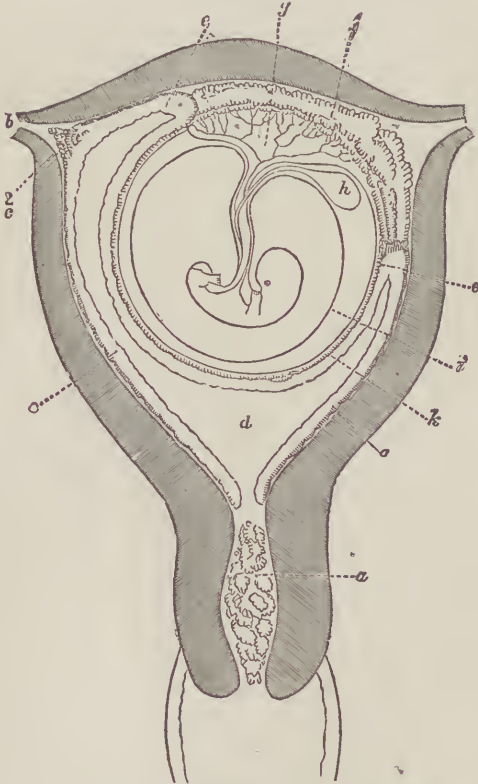
Fig. 41* represents a section of the uterus with the ovum somewhat advanced, and almost completely occupying the uterine cavity: *a*, muco-gelatinous substance blocking up the os uteri; *b b*, Fallopian tubes; *c c*, decidua vera prolonged, at *c 2*, into the Fallopian tube; *d*, cavity of the uterus; *e e*, angles at which decidua vera is reflected; *f*, decidua serotina; *g*, allantois; *h*, umbilical vesicle; *i*, amnion; *k*, chorion, lined with outer fold of serous tunic.

Whatever may be the origin of the decidua—whether it is an *excretion* of coagulable lymph, a hypertrophy of the uterine mucous membrane, or a *secretion* from the blood—it is certain that during the formation of the decidua reflexa both the ovum and the body of the uterus become considerably enlarged; but after the third month all of the decidua, except that portion to which the ovum first became attached, gradually becomes thinner and, in appearance, less glandular. The decidua uteri remains quite thick, especially around the placenta, until the end of gestation; but the decidua reflexa is, at this time, extremely thin. Toward the third or fourth month they touch and press upon each other; but, according to M. VELPEAU and BISCHOFF, they are never confounded.

M. VELPEAU considered the use of the decidua to be to retain the impregnated ovum at a given point of the uterine cavity. M. BRESCHET affirms that it exists in all cases of extra-uterine pregnancy, and hence can not belong to the ovum. CHAUSSIER found it in cases of tubal gestation; and EVRAT supposes that one is secreted after each act of sexual intercourse; M. POUCHET thinks it is formed at each menstrual period; while Dr. ROBERT LEE declares that it is not found in all cases of extra-uterine pregnancy.

* For illustration see next page.

FIG. 41.



UTERUS NEARLY FILLED WITH THE OVUM.

Fig. 42 is a representation of extra-uterine pregnancy occurring in the right Fallopian tube: *a*, uterus, its cavities laid open; *b*, uterine walls thickened, as in normal pregnancy; *c*, a portion of decidua separated from its inner sur-

FIG. 42.



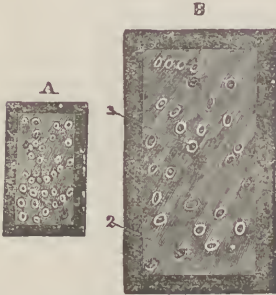
EXTRA-UTERINE PREGNANCY.

face; *d*, bristles to show the direction of the Fallopian tubes; *e*, right Fallopian tube distended into a sac which has burst, containing the extra-uterine ovum: *f*, foetus; *g*, chorion; *h*, ovaries; in the right one is a well-marked corpus luteum, *i*.

WEBER and SHARPEY do not regard the decidua as a new formation, and M. COSTE says: "The only modifications of which the uterus becomes the seat consist in the turgescence or erethism of its tissue, and more especially in a considerable thickening of its mucous membrane—a thickening which results especially from congestion of the blood vessels, and an extreme development of the glands that enter into its composition, and, in certain subjects, plait them into more or less numerous convolutions." He adds: "In the normal state neither the opening of the cervix uteri, nor that of the Fallo-

pian tubes, is closed by membrane. They are always free, permeable, and consequently permit the ovum to pass into the cavity of the uterus; and the folds of the mucous membrane, by coming in contact, are sufficient to arrest it."

FIG. 43.

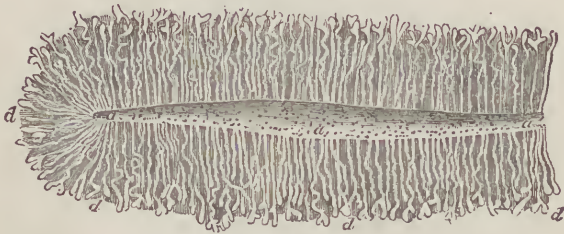


SEGMENTS OF DECIDUA.

In Fig. 43 are seen two thin segments of human decidua, after recent impregnation, viewed on a dark ground. They show the openings on the surface of the membrane.

Mr. GOODWIN states that the interfollicular spaces, in which the network of capillaries is situated, are occupied by a texture consisting wholly of nucleated particles, "a tissue represented by BAER and WAGNER as surrounding what they supposed to be uterine papillæ, and regarded by them as decidua."

FIG. 44.



UTERINE SECRETION AT THE COMMENCEMENT OF PREGNANCY.

Fig. 43 is a representation of a section of the mucous membrane of the human uterus at the period of commencing pregnancy, showing the arrangement and other peculiarities of the glands, *d d d*, with their orifices, *a a a*, on the internal surface of the organ. They are magnified to twice the normal size.

DALTON, as well as other late authors, regard the decidual

membrane as intended to supply the fecundated ovum with the requisite materials for its nourishment — a proposition which its structure and manner and time of development seems to render almost self-evident. He remarks: “The uterine mucous membrane is developed during the process of gestation, in such a way as to provide for the nourishment of the foetus in the different stages of its growth. At first the whole of it is uniformly increased in thickness (*decidua vera*). Next, a portion of it grows upward around the egg, and covers its projecting surface (*decidua reflexa*). Afterward, both the *decidua reflexa* and the greater part of the *decidua vera* diminish in the activity of their growth, and lose their importance as a means of nourishment for the egg; while that part which is in contact with the vascular tufts of the chorion, continues to grow, becoming exceedingly developed and taking an active part in the formation of the placenta.”

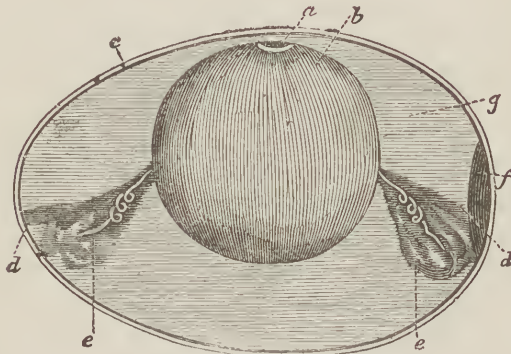
CHAPTER VIII.

EMBRYOLOGY.

DEVELOPMENT OF THE GERM.—As the process of development between the egg of the fowl and the human ovum is strikingly analogous, and, indeed, in all essential particulars precisely similar, and as the changes which occur in the fecundated egg are more conveniently traced than those which take place in the impregnated ovum, it will be profitable to examine the data which have been furnished by the observations made with respect to both.

Fig. 45 is a section of a bird's egg, representing: *a*, cica-

FIG. 45.



SECTION OF BIRD'S EGG.

tricula; *b*, yolk; *c*, shell membrane; *d*, attachment of chalazæ; *e*, chalazæ; *f*, air chamber; *g*, albumen.

When the ovum of the mammalia leaves the ovary it consists of the yolk or vitellus contained in its membrane, the germinal vesicle, and the germinal spot. The yolk, as we

have seen, serves the same purpose for the animal as the oily and starchy matters in the seeds serve for the plant. It is the nutriment of the embryo. In its passage through the oviduct, the yelk is gradually exhausted, and the albumen, or white, supplies its place. CARPENTER says: "Our knowledge of the first stages of the developmental process in the mammalian ovum, is, in many respects, incomplete; and it is requisite to interpret what has been obscurely seen in the ova of this class, by the clearer views derived from observation of those of the lower animals. As already stated, the germinal vesicle disappears at or about the time of fecundation; but its disappearance is not a result of fecundation, since it also takes place in the unimpregnated egg, in consequence, it may be presumed, of the completion of its term of life, and of those operations which it was developed to perform. Its place is seen to be occupied, at an early period after fecundation, by a new and peculiar cell, the origin of which is obscure, but the destination of which is most important; for it is by the duplicative sub-division of this cell, first into two, then into four, then into eight, and so on, and by the metamorphosis which its progeny undergo, that the whole embryonic fabric is

FIG. 46.



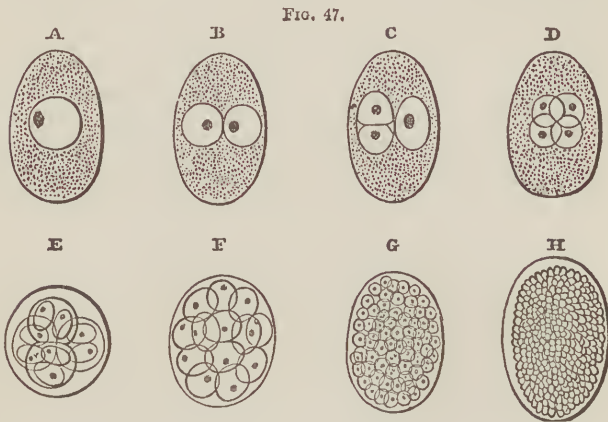
CLEAVING OF THE YELK

gradually evolved; hence, this cell may be termed the *embryo-cell*. At the same time, a peculiar change begins to take place in the yelk, the whole sphere of which is just marked out by a furrow into two hemispheres, and is at last completely divided by the extension of this centre; each half is again furrowed and then cleft in the same manner, and thus the entire yelk is broken up into a mass of segments."

Fig. 46 is a representation of the cleaving of the yelk after fecundation: *A B C*, ovum of *ascaris nigrovenosa*; *D* and *E*, that of *ascaris acuminata*.

SEGMENTATION OF THE VITELLUS.—This process of duplication of cells, which KOLLIKER and BAGGE have depicted as seen in the ova of certain parasitic worms, in which it presents itself in the least complex form, continues, the cells becoming progressively smaller, until a large mass of cells are produced, the whole assuming the form of the embryo.

The progressive multiplication of cells is represented in Fig. 47. *A B C D*, successive stages of the ovum of *ascaris dentata*, showing the duplication of the cells; *E F G H*, ovum of *cucullanus elegans*, showing the advance of the process.

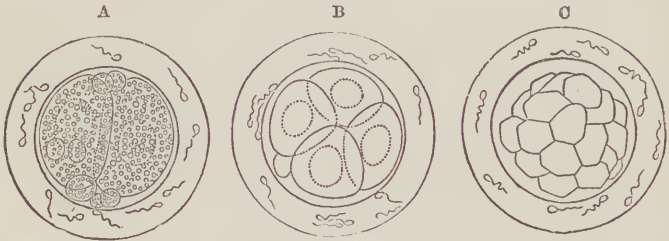


DUPLICATION OF CELLS.

In some entozoa the embryonic portion is embedded in the interior of the vitellus, and as the cells multiply they appropriate the surrounding nutrient matter, until the whole yelk is exhausted, and the original yelk-membrane is filled with a mulberry-like mass of cells. But more commonly each cell formed by the cleaving of the embryonic vesicle appropriates a certain portion of the yelk.

“These changes,” says CARPENTER, “take place in the mammalian ovum during its transit along the Fallopian tube to the uterus, so that by the time of its arrival there, the whole cavity of the *zona pelucida* is occupied by minute spherules of yelk, each containing a transparent vesicle, the aggregation of which gives it a mulberry-like aspect; and by a continuance of the same process of subdivision, the component seg-

FIG. 48.

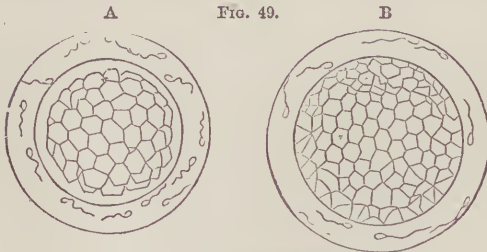


SEGMENTATION OF MAMMALIAN OVUM.

ments becoming more and more minute, the mass comes to present a fine granular aspect.”

Fig. 48 is a representation of the progressive stages in the segmentation of the mammalian ovum: *A*, its first division

FIG. 49.



LATER STAGE OF SEGMENTATION.

into two halves; *B*, subdivision of each half into two; *C*, further subdivision, producing numerous segments.

In Fig. 49, the segmentation of the yelk of the mammalian ovum is represented in a later stage. At *A*, is shown the

“mulberry mass,” formed by the minute subdivisions of the vitelline spheres; at *B*, a further increase has brought its surface into contact with the vitelline membrane, against which the spherules are flattened.

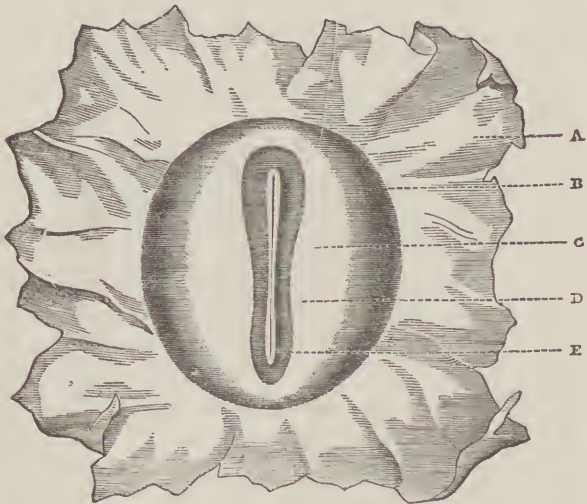
THE BLASTODERMIC MEMBRANE.—By the time that the “vitelline spheres” have become subdivided into the “mulberry-shaped mass,” they are *supposed* to be transformed into true animal cells, which, adhering by adjacent edges form a continuous organized membrane. This is the *Blastodermic Membrane*, called, also, the *germinal* membrane. This membrane soon divides into two layers termed the *external* and *internal layers*. Says DALTON: “They are both still composed exclusively of cells; but those of the external layer are usually smaller and more compact, while those of the internal layer are rather larger and looser in texture. The egg then presents the appearance of a globular sac, the walls of which consist of three concentric layers, lying in contact with and inclosing each other, viz.: 1. The structureless vitelline membrane on the outside; 2. The external layer of the blastodermic membrane, composed of cells; 3. The internal layer of the blastodermic membrane, also covered with cells. The cavity of the egg is occupied by a transparent fluid, as above mentioned.

“This entire process of the segmentation of the vitellus and the formation of the blastodermic membrane is one of the most remarkable and important of all the changes which take place during the development of the egg. It is by this process that the simple globular mass of the vitellus, composed of an albuminous matter and oily granules, is converted into an organized structure. The blastodermic membrane, though consisting only of cells nearly uniform in size and shape, is nevertheless a truly organized membrane, made up of fully-formed anatomical elements. It is, moreover, the first sign of distinct organization which made its appearance in the egg; and as soon as it is completed, the body of the

new foetus is formed. The blastodermic membrane is, in fact the body of the foetus."

The development of the egg commences in the same way in all classes of animals. All of the organs of the foetus commence their development with the two layers of the blastodermic membrane, the spinal column and all the organs of universal life—the cerebro-spinal system—being developed by the external layer, while the intestinal canal and all the organs of vegetative life—the organic system—are developed by the internal layer. The external layer has also been termed

FIG. 50.



GERMINAL MEMBRANE.

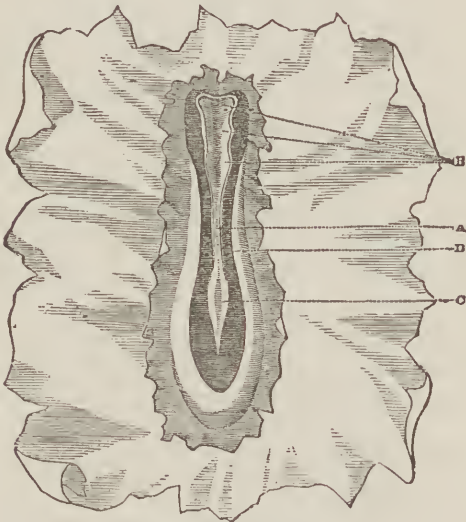
serous or *animal*, while the internal has been called *mucous* or *vegetative*.

Fig. 50 is a representation of a portion of the germinal membrane of the ovum of a bitch, with the area pellucida and rudiments of the embryo magnified ten diameters. *A*, germinal membrane; *B*, area vasculosa; *C*, area pellucida; *D*, laminæ dorsales; *E*, primitive groove, bounded laterally

by the pale pellucid substance of which the central nervous system is composed.

The *area germinativa* changes from a rounded form to that of an oval, and then becomes pyriform in shape, during which changes a clear space is seen in the centre. This is the *area pellucida*, bounded externally by an opaque circle which subsequently becomes the *area vasculosa*, in which blood vessels are first developed. The embryo first appears in the serous, external, or animal layer of the blastodermic or germinal

FIG. 51.



EMBRYONIC RUDIMENTS.

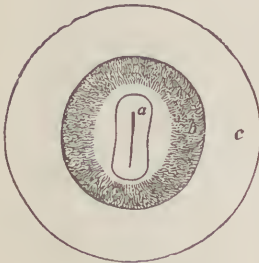
membrane, in the centre of the area pellucida, consisting of a trace or streak termed *primitive groove*, with two oval marks (*laminae dorsales*) on each side. As these become more raised, the elevated points approach each other, and ultimately convert the groove into a tube, which is the seat of the future great central organs of the nervous system—the brain and spinal cord. At the same time the rudiments of

the vertebral column, termed *chorda dorsalis*, are seen in a row of cells on a line parallel with the primitive groove.

Fig. 51 is a representation, after BISCHOFF, of a portion of the germinal membrane, with rudiments of the embryo, from the ovum of a bitch: *A*, the primitive groove, is not yet closed; at its upper or cephalic end it presents three dilata-tions, *B*, which correspond to the three divisions or vesicles of the brain. At its lower extremity the groove presents a lancet-shaped dilatation (*sinus rhomboidalis*), *C*. The margins of the groove consist of clear pellucid nerve-substance. Along the bottom of the groove is observed a faint streak, which is probably the *chorda dorsalis*; *D*, vertebral plates.

While the dorsal laminae are closing the primitive groove by an approximation of their raised portions, prolongations of the internal layer of the germinal membrane extend from the lower margin of each. These prolongations are termed visceral or ventral laminae—*laminae ventrales seu viscerales*. The ventral laminae, extending downward and inward toward the cavity of the yolk, unite and form the interior wall of the trunk. At the same time an accumulation of cells between the external and internal layers of the germinal membranes become arranged into a distinct structure or layer termed the *vascular*. In this vascular membrane the first ves-sels of the embryo are developed.

FIG. 52.



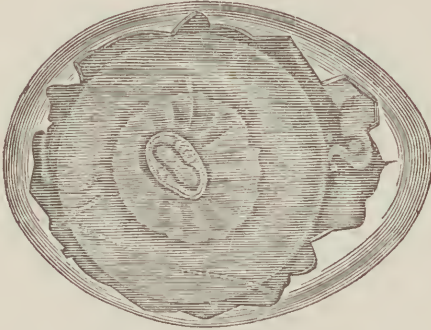
VASCULAR AREA.

INCUBATION.—Fig. 52 represents the vascular area in the chick thirty-six hours after incubation (after WAGNER): *a*, yolk; *b*, fiddle-shaped pellucid area, in the middle of which is the embryo. In the vascular area, *c c*, the blood islets (*insulae sanguinis*) begin to appear.

The general internal appearance of the egg thirty-six hours after in-cubation is represented in Fig. 53.

As the vascular layer develops, the *insulæ sanguinæ*, or blood dots, appear at the circumference of the vascular area,

FIG. 53.



EGG THIRTY-SIX HOURS AFTER INCUBATION.

and, gradually uniting, form vessels which have a circular shape and retiform appearance, and are filled with blood. These vessels have been termed *venous circle* (*circulus venosus*),

FIG. 54.

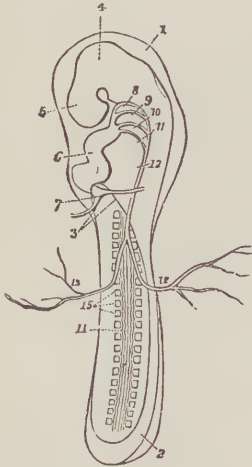


EGG OPENED THREE DAYS AFTER INCUBATION.

and *terminal vein* or *sinus* (*vena seu sinus terminalis*). These vessels, constituting the *vascular area*, or *figura venosus*, are generally extended over the whole surface of the membrane that

contains the yelk, as seen in Figs. 53, 54 and 55, which are representations of the chick at different stages of incubation.

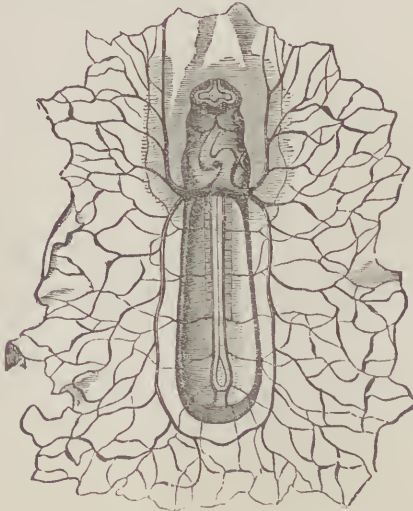
FIG. 55.



EMBRYO OF THE CHICK.

Fig. 55 represents the embryo of the chick at the commencement of the third day, as seen from the abdominal aspect (after WAGNER): 4, prominence of the corpora quadrigemina, or optic lobes of the brain; 5, the anterior cerebral mass or hemispheres; 6, the heart; 7, entrance of the great venous trunks in the atrium cordis or auricle; 8, 9, 10 and 11, the four aortic arches; 12, the descending aorta; 13, the arteries of the germinal membrane; 14, the dorsal lamina, rendered slightly wavy by the action of water; 15, the rudiments of the vertebræ.

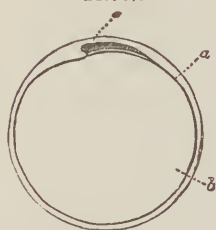
FIG. 56.



EMBRYO FROM A BITCH.

Fig. 56 is a representation of the embryo from a bitch at the twenty-third or twenty-fourth day, magnified ten diameters (after BISCHOFF). It shows the net-work of blood vessels in the vascular lamina of the germinal membrane and the trunks of the omphalo-mesenteric veins entering the lower part of the S-shaped heart. The first part of the aorta is also seen.

FIG. 57.



EARLY UTERINE OVUM.

When the parietes of the abdomen are formed, which takes place at an early period of embryonic life, by a constriction in the fold of the germinal membrane, the yelk-sac becomes the *umbilical vesicle* (*vesicula umbilicalis*). Fig. 57 is a plan of early uterine ovum (after WAGNER). Within the external ring, or zona pellucida, are the serous lamina, *a*; the yelk, *b*; the incipient embryo, *c*.

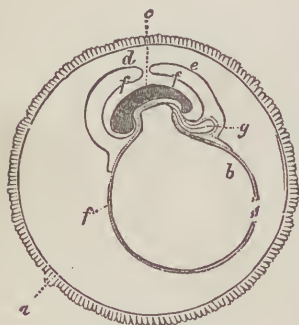
As the umbilical vesicle (whose walls are formed of the several layers of the blastodermic membrane) develops, another vesicle extends from the caudal extremity of the embryo. This is the *allantois*, or *allantoid vesicle*, which is seen in several stages of development, both in the egg of the hen and in the human ovum, in the following figures.

The walls of the allantois, when developed, become very vascular, and contain the ramifications of the subsequent umbilical arteries and umbilical vein. It is regarded as a temporary organ of respiration, by bringing the vessels of the chick in relation with atmospheric air, and, in the mammalia, conveying the embryonic vessels to and from the chorion.

Fig. 58 (from WAGNER) shows the amnion in the process of formation, by the arching over of the serous lamina: *a*, the chorion; *b*, the yelk-bag, surrounded by serous and vascular lamina; *c*, the embryo; *d e f*, external and internal folds of the serous layer, forming the amnion; *g*, incipient allantois.

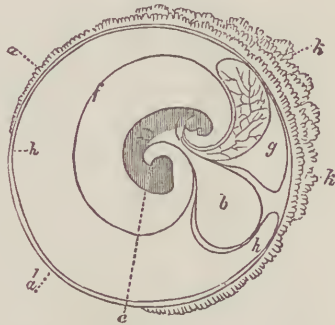
Fig. 59 is a diagram representing a human ovum in the second month of pregnancy (from WAGNER): *a* 1, smooth por-

FIG. 58.



FORMATION OF THE AMNION.

FIG. 59.



HUMAN OVUM IN SECOND MONTH.

tion of chorion; *a* 2, villous portion of chorion; *k k*, elongated villi beginning to collect into placenta; *b*, yelk-sac, or umbilical vesicle; *c*, embryo; *f*, amnion (inner layer); *g*, allantois; *h*, outer layer of amnion, coalescing with chorion.

FIG. 60.



EGG FIVE DAYS AFTER INCUBATION.

The allantois is divided at the umbilicus by a closing of the visceral laminæ in the abdominal cavity, into two partitions, the larger of which proceeds with the umbilical vessels to the

chorion, while the smaller is retained in the abdomen and converted into the urinary bladder—the two portions being connected by the *urachus*.

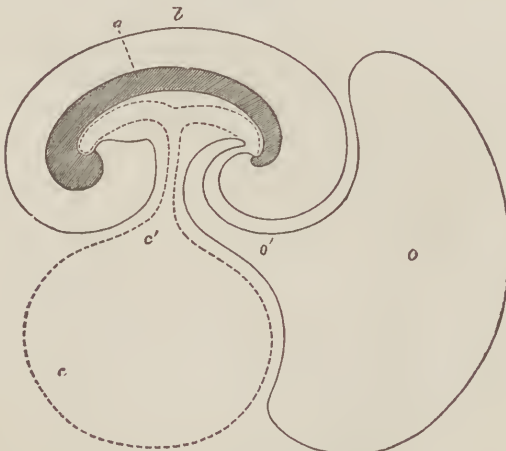
FIG. 61.



EGG TEN DAYS AFTER INCUBATION.

While the changes above mentioned are taking place, the cephalic, caudal and lateral edges of the internal layer of the

FIG. 62.



UMBILICAL VESICLE AND ALLANTOIS.

blastodermic membrane are elevated in the form of two folds, extended over the body of the embryo, and, meeting on its dorsal aspect, inclose it in a double envelope, the inner layer of which forms the sac of the amnion, while the external layer lines the inner surface of the chorion.

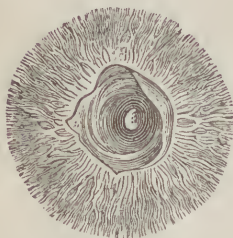
The mode of the development of the umbilical vesicle is represented in Figs. 58, 59 and 62. Fig. 62 is a representation of the umbilical vesicle, allantois, etc.: *a*, the dorsal structures of the embryo; *b*, the amnion; *c*, the yelk-sac or umbilical vesicle; *c'*, the vitelline duct or pedicel of the umbilical vesicle; *d*, the allantois; *d'*, the urachus.

FIG. 63.



OVUM FOURTEEN DAYS OLD.

FIG. 64.



OVUM AND EMBRYO FIFTEEN DAYS OLD.

The following figures (63, 64, 65, 66) represent the human ovum in various stages of progress till three weeks old. But the data on which our calculations as to time are predicated, manifestly can not be very exact. Says DUNGLISON: "From the difficulty of appreciating the exact age of any ovum or its contained embryo, it is impracticable to assign any precise weight or measurement, or, indeed, any special development to the different periods of intra-uterine existence. The discordance among observers is indeed extreme."

The force of this remark will be still better appreciated when it is considered that it is not yet settled whether impregnation really takes place (in the majority of cases, and hence normally) in the uterus or in the ovary of the human female—a subject I shall consider hereafter.

The weight of the embryo at the end of the second week is, as near as has been ascertained, about one grain, and its length about one-twelfth of an inch. At the end of the third week its size and shape have been compared to a large ant, a

grain of barley or lettuce, the mellens of the ear, etc. On the thirtieth day the situation of the upper and lower extremities

FIG. 65.



OVUM AND EMBRYO THREE WEEKS OLD.

become visible ; the length has increased to one-third of an inch, and the rudiments of the principal organs are apparent.

FIG. 66.



FŒTUS AT FORTY-FIVE DAYS.

FIG. 67.



FŒTUS AT TWO MONTHS.

About the fortieth day the shape of the child may be recognized, when, in anatomical parlance, it ceases to be embryo and becomes *fœtus*. Some anatomists, however, do not apply the term *fœtus* to the embryo until after the beginning of the fourth month, when its motions in utero are noticed

by the mother. This is called the *period of quickening*.

The head is very large in proportion to the body ; the trunk is elongated and pointed ; the limbs resemble the shoots of vegetables ; dark points or lines indicate the existence of the eyes, mouth and nose, and parallel points indicate the situation of the vertebra. The length is nearly one inch or about ten lines.

In the second month nearly all of the parts are apparent. The eyelids are well-defined and extremely transparent; the nose projects, the mouth enlarges and opens, the fingers and toes are distinct.

In the third month the eyelids are more developed and firmly closed; the *meatus auditorius* is indicated by an opening in the pavilion of the ear; the sides of the nose—*a la nasi*—are distinguishable; the lips are distinct, and the mouth shut. During this month the genital organs are rapidly developed. The penis is long; the scrotum frequently contains a little water, but the testes are absent. The vulva is apparent, and the clitoris very prominent. The brain is considerably developed though still pulpy, as is the spinal cord. The lungs are insignificant, but the liver is large. The heart's action is easily detected. The upper and lower limbs are fully developed. The foetus is now three and a half inches in length, and weighs two and a half ounces.

During the fourth month the head and liver increase less in proportion than the other parts; the muscular system becomes distinct, and slight movements are manifested. At the end of four months and a half the length of the foetus has increased to five or six inches, and the weight to four or five ounces.

During the fifth month the muscular system becomes well marked, and the movements of the foetus active and unequivocal. The head is still disproportionately large, and begins to be covered with small silvery hairs. The length is seven to nine inches; weight, six to eight ounces.

In the sixth month the derma or true skin begins to be distinguishable from the epidermis or cuticle. The skin is of a purple color, smooth and delicate, and, owing to the absence of adipose matter in the subcutaneous areolar tissue, seems plaited or wrinkled. The scrotum is small and of a deep red color; the vulva prominent, its lips separated, and the clitoris projecting; the nails are formed. The length is ten or twelve inches, and the weight nearly two pounds. Foetuses born at

this period usually breathe and cry for a short time, but are rarely viable.

During the seventh month all parts of the body very nearly attain their permanent proportions. The head occupies the

FIG. 68.



FÆTUS AT THREE MONTHS IN ITS MEMBRANES.

lower portion of the uterine cavity, and is directed toward its mouth or orifice—*os uteri*. The finger passed into the vagina readily detects it as a rounded, firm, but movable body. The eyelids begin to separate, and the *membrana pupillaris*, which previously closed the pupil, begins to disappear; the whole form becomes more rotund from the increase of fat; the skin is redder, and its sebaceous follicles excrete a white cheesy substance termed *vernix caseosa*. The length at seven months is about fourteen inches, and its weight nearly three pounds.

In the eighth month the foetus develops proportionably more in breadth than in length, and the child at this period, is regarded as capable of maintaining an independent existence. The testicles, which were formed within the abdominal parietes, descend into the scrotum; the ossification of the bones of the skull, ribs and limbs is nearly completed; the nails are also completely formed. The length is sixteen inches, and the weight upward of four pounds.

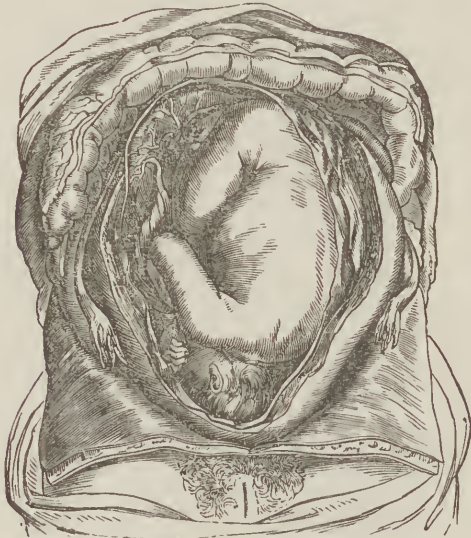
At the end of nine months the length of the foetus is ordinarily eighteen to twenty inches, and the average weight six to eight pounds. It is then fully matured—the normal period of pregnancy, or *full term*, being generally reckoned at about two hundred and eighty days.

Numerous cases are, however, on record in which the measurement and weight greatly exceed the above calculations. In some well authenticated cases the child at birth has measured twenty-four inches in length; and obstetricians of character and experience have published cases of children weighing at birth from ten to fifteen pounds. One or two cases are recorded in which the weight exceeded seventeen pounds. In the cases of twins the weight of each is usually somewhat less than in uniparous cases, but their united weight is greater. M. DUGES, of Paris, ascertained the average weight of one hundred and forty-four twins to be four pounds, the extreme weights being three and eight pounds. It should be remarked, however, that the tables furnished by authors, on the length and weight of foetuses at different periods of gestation and at birth, are considerably discordant, as all observations must be when the subjects of them are suffering under a great amount and variety of abnormal conditions; and this difficulty is further complicated by the ignorance or uncertainty that exists respecting the changes which the embryo undergoes during the early period of its existence.

POSITION OF THE FŒTUS.—The cause of the position of the

fœtus in utero, during the various periods of gestation, has not been very clearly explained. The "law of gravitation" which, it has been assumed, *draws* the more weighty head to the lowest part of the uterine cavity, is more the expression of a theory than the rationale of a fact. Professor SIMPSON and others are of opinion that, until about the sixth month, the normal position of the head is uppermost, and that the change of position is then a vital act, dependent on the motions of the fœtus. Certain it is, that the position with the head

FIG. 69.



FULL PERIOD OF UTERO-GESTATION.

downward—which is the usual and only strictly normal position—is best adapted to the process of delivery. This position is shown in Fig. 69.

As seen in the cut, the body is bent forward; the chin resting on the breast; the back part of the head, *occiput*, toward the brim of the pelvis; one or both arms lying upon the face,

and both approximated in front; the thighs flexed upon the abdomen; the knees apart; the legs drawn up and crossed; the feet bent upon the anterior surface of the legs—the whole body forming an oval whose long diameter is about ten inches.

FŒTAL DEPENDENCIES.—These are: 1. The two membranes which constitute the parietes of the ovule, the external of which is called *chorion*, and the internal, which contains a fluid in which the fœtus floats, is called *amnion* or *amnios*; 2. The *placenta*, a spongy, vascular body, external to the chorion, covering about one-fourth of the ovule, and connecting it with the uterus; 3. The *umbilical cord*, or *navel string*, containing the blood vessels which maintain the circulation between the placenta and the fœtus; 4. The *umbilical* and *allantoid* vesicles.

The *Chorion*, according to M. VELPEAU, becomes thick, opaque, resisting and flocculent at both surfaces, about the twelfth day after conception; but as the normal *place* for impregnation is yet a disputed problem, so the authors do not agree *where* the ovum receives the chorion. Some think it is received as the ovum passes along the Fallopian tube; others maintain that it is formed in the ovary; while others still, taking the opposite extreme, contend that it is produced in the uterus. The inner surface of the chorion corresponds to the amnion; and the two membranes, in early fœtal life, are separated by an albuminous fluid. At the end of about three months this fluid disappears, when the membranes are in contact. By some anatomists the chorion is regarded as consisting of two layers, the external of which is called *exochorion*, and the internal *endochorion*.

The *Amnion*, which lines the inner surface of the chorion, contains the fœtus, and is filled with a serous fluid. In the early period of fœtal existence it adheres to the chorion only by a point, which corresponds to the abdomen of the fœtus. The other parts of the membranes are separated by the serous fluid above mentioned, which is termed *false liquor amnii*. The membranes subsequently coalesce; but the adhesion, except

at the placenta and umbilical cord, is very feeble. As pregnancy advances this membrane becomes thicker, and at full term is much tougher and more tenacious than the chorion. Both the amnion and the chorion cover the foetal surface of the placenta, envelop the umbilical cord, and, extending to the umbilicus of the foetus, there become blended with the skin. The serous fluid—*liquor amnii*—contained within the amnion, is transparent in early foetal life, but at full term the flocculi of an albuminous substance give it a milky appearance. It has a saline taste, a spermatic odor, and a viscid and gelatinous consistence. According to the analysis of VAUQUE-

FIG. 70.



MATERNAL SURFACE OF THE PLACENTA.

LIN and BUNIVA, its solid constituents—albumen, chloride of sodium, soda, phosphate of lime and lime—amount to only 1·2 parts in 100, the remainder, 98·8, being water. The analysis, however, by no means proves that all of these ingredients are *normal* constituents, nor that they exist *normally* in the above quantities or proportions.

The quantity of fluid contained in the amnion is in inverse ratio to the size of the foetus. The source of this fluid is not yet well ascertained, some physiologists ascribing it to the

mother, others to the foetus. Its quantity varies from a few ounces to three or four pints.

The *Placenta*, or *after-birth*, is a soft, flat, spongy, highly vascular body, in most cases of a circular shape, but sometimes assuming the oval form. It is the medium of communication between the mother and child, its office being to supply nutrient material to the foetus. It is usually from six to eight inches in diameter, and from an inch to an inch and a half in

FIG. 71.



FETAL SURFACE OF THE PLACENTA.

thickness at its centre, gradually becoming thinner toward its circumference. Its average weight is about one pound. One of its surfaces corresponds to the foetus, the other to the uterus. Figs. 70 and 71 represent these surfaces.

The distribution of the umbilical arteries and veins give to the foetal surface an arborescent appearance resembling the branches of a tree; it has also been called membranous, because both the chorion and amnion pass over it. The foetal surface is smooth and glistening. The maternal or uterine surface is in contact with the uterus, and after its detachment it exhibits an irregular, broken aspect.

There is, probably, no direct vascular connection between

the mother and foetus, the blood vessels of the maternal portion of the placenta not being continuous with those of the foetal portion. The contrary opinion has long been held; but it seems now to be well established that, physiologically, the placenta consists of two distinct parts, each having a circulation independent of that of the other. The circulating vessels on the foetal surface are those of the umbilical cord, while utero-placental vessels maintain the circulation on the maternal surface. It is stated, also, as a further evidence that these circulations are distinct, that the size and relative number of the red corpuscles which are found in the blood of the parent differ from those found in the blood of the foetus, and that there is also a difference in the relative amount of fibrin and albumen.

The fact that madder administered to a pregnant female will readily color the bones of the foetus, only proves the permeability of the two sets of vessels in the placenta. The formation of the placenta does not commence until the second month of pregnancy.

The Umbilical Cord (*Funis umbilicus*) is the channel of communication between the foetus and the placenta. It is composed of two arteries and one vein, and its length, at all periods of foetal development, is generally about equal to that of the body of the foetus. The arteries convey the *impure* blood of the foetus to the placenta, while the vein carries *arterial* blood from the placenta to the foetus. This may seem like a contradiction of terms; but it must be recollected that, in the language of anatomy, a vein is a blood vessel going toward the heart, while an artery is a blood vessel proceeding from the heart, this organ being regarded as the centre of the circulation.

At the end of five or six weeks after conception the cord is straight, shut and very large, owing to its containing a portion of the intestinal canal, presenting, also, three or four enlargements or dilatations, which gradually disappear, after which the cord lengthens and becomes smaller. It is fre-

quently knotted and twisted as represented in the cut (Fig. 72). After the fifth week the umbilical cord contains, in addition to the duct of the umbilical vesicle, the omphalo-

FIG. 72.



KNOTTED UMBILICAL CORD.

mesenteric vessels, and a portion of the allantoid vesicle and intestines.

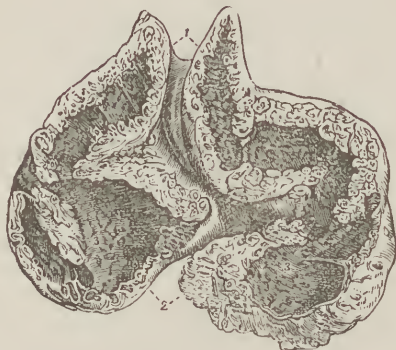
The *Umbilical Vesicle*, termed also *vesicula alba* and *intestinal vesicle*, was unknown to the ancients, and some of the modern authors are disposed to regard it as an abnormal product. It seems to be situated between the chorion and amnion, and to disappear about the sixth or seventh week.

FÆTAL PECULIARITIES.—The head is disproportionately large, and the bones of the skull are united by membrane—a circumstance which allows the bones to approach and even to overlap each other in the process of parturition, thus greatly facilitating the delivery of the head. These membranous or unossified portions are important guides to the midwife in determining the position or “presentation” of the head. In the anterior superior portion of the skull is a soft depression, having four angles, termed the *anterior fontanelle*, and in the posterior superior portion, having three angles, termed the *posterior fontanelle*. When the head presents in the best possible position for delivery, the finger of the accoucheur on

being passed into the uterus readily comes in contact with the *posterior fontanelle*, which is found near the symphysis pubis, while the anterior fontanelle will be toward the sacrum, on the opposite side of the pelvic cavity.

In the upper part of the thorax, situate in the superior mediastinum over the upper portion of the pericardium, is a large glandular structure termed *Thymus*. Its greatest bulk is usually attained near the end of embryonic life, although in some cases it is said to have increased slightly after birth. But in most cases it rapidly diminishes after birth, becoming

FIG. 73.



SECTION OF THYMUS GLAND.

very small at adult age, and almost or quite undistinguishable in old age. Its average weight at birth is about half an ounce. It has no excretory duct, is well supplied with nerves, and contains a fluid resembling chyle or cream. Its function is completely unknown, but I have no doubt it is one of the appendages of the organic nervous system, serving as an additional source of nervous power to the nutrient system, especially in developing the pulmonary apparatus. Its structure and location are certainly in harmony with this view, as are the changes it undergoes before and after birth. DUNGLISON says: "It is one of the most obscure, in its physiology, of any organ of the body."

The *Thyroid Gland* has a similar history and structure, and undoubtedly a similar function.

The *Lungs* are collapsed and dense, of a dark color, like liver, and do not fill the cavity of the chest, and, having a greater specific gravity than water, readily sink when immersed in that fluid. The mean weight of the lungs compared with the body, of a full-grown foetus which has never breathed, has been calculated by M. PLOUQUET as 1 to 70.

The digestive organs exhibit nothing remarkable except the presence in the bowels, at full term, of a quantity of dark or greenish fæces, termed *meconium*, from its resemblance to the inspissated juice of the poppy. It consists mainly of the excretions of the liver and intestinal canal, and usually passes off without difficulty soon after the child begins to nurse. The common practice of giving purgative or even laxative medicines, whether it be castor oil or sweetened urine, to expel the meconium is exceedingly pernicious.

The *Liver* is very large and rapidly diminishes after birth, a part of its decarbonizing function being then transferred to the lungs.

The *Bladder* is large and elongated, and seems to possess more proportionate power than in adult life. From the fundus of the bladder a conical ligament, called *urachus*, ascends between the umbilical arteries to the umbilicus, forming a kind of suspensory ligament to the bladder.

The development of the genital organs have occasioned many fanciful speculations with regard to the cause of sex. The sexual organs are not perceptible until near the commencement of the sixth week, when a small cleft eminence appears—the rudiment of the scrotum or vulva. Soon after an aperture becomes perceptible, which is common to the genital organs and anus. In front of this aperture is a projecting tubercle, which, a week or two later, manifests a glans, and is grooved on its under surface by a channel which extends to the anus. At about the twelfth week the perineum, which separates the anus and genital organs, is formed. The

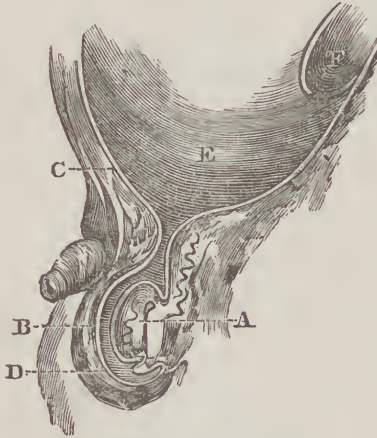
sex becomes distinctly apparent about the fourteenth week. But as there remains for some time a groove beneath the penis or clitoris, which is soon formed into a canal in the former case, or closed in the latter, TIEDEMANN and others have advanced the hypothesis that every embryo is originally female, and that, when arrested at an inferior point of organization, it remains female. To constitute the male, in his opinion, the cleft (vulva) is united to form a raphe; the tubercle (clitoris) is elongated into a penis; the labia majora are united to form the scrotum, and the nymphæ are joined to form the urethra. Other physiologists, however, believe that the sexes are originally neuter, and that the sex is determined by accidental circumstances at the time of conception or during the early period of foetal life—as though there *could* be accidents in the order of Nature. Still others, among whom are M. VELPEAU, maintain that the original sex is masculine. These phantasies will be disposed of in the chapter on the Law of Sex.

The *Descent of the Testes* deserves a brief explanation in this place. In the early months of embryonic life, the testicles are situate below the kidneys in the abdominal cavity. At about the seventh month they are in a state of progression toward the scrotum. About the middle of the third month a sheath of peritoneum extends from the abdominal ring to the lower part of the testicle; it also contains a ligament which is termed *gubernaculum testis*; surrounding this is a thin layer of muscular fibre, known as the *cremaster*, by whose contraction the testicle is moved. During the descent the cremaster muscle is gradually everted, and when the transition is completed, it constitutes a covering or envelope external to the peritoneal sheath which immediately surrounds the gland. In Fig. 74, *a* is a representation of the testicle in the scrotum; *b*, prolongation of the peritoneum; *c*, peritoneum lining the abdomen; *d*, peritoneum forming the tunica vaginalis; *e*, cavity of the peritoneum; *f*, kidney.

In its "descent" (which is literally *ascent*, as the head of

the foetus is downward in the uterus) the testicle passes successively from one portion of the peritoneum behind another immediately below; and the lowest part of the pouch formed around the testicle becomes the *tunica vaginalis testis*, while

Fig. 74.



DESCENT OF THE TESTICLE.

that portion of the peritoneum which descended before the testicle, becomes eventually the *tunica vaginalis* or second coat.

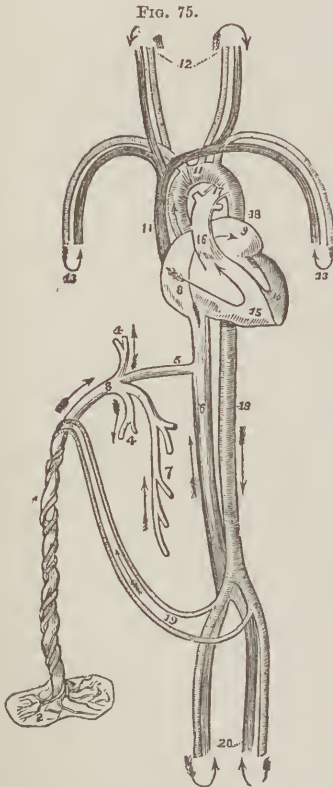
When the neck of the pouch does not completely close, after the testicle has reached the lower part of the scrotum, the intestines pass down constituting congenital hernia.

The descent of the testicles are not always completed at birth; in some instances one or both will remain for weeks or months in the abdomen; and in rare cases one or both remain in the abdominal cavity during life, creating a suspicion of defect or deformity, but not materially interfering with the normal function. I have known several cases in which one testicle remained in the abdomen, and the party was *accused* of having only one testicle.

CIRCULATION OF THE FŒTUS.—As the blood can not circulate

through the lungs of the foetus, an opening exists between the right and left auricle, called the *foramen ovale*, through which the circulating current passes from the venous to the arterial system. This foramen has a valve which allows part of the blood of the right auricle to pass through the opening into the left auricle, but prevents its return.

The pulmonary artery is divided into three branches, the right and left, which go to the corresponding lungs as in the adult, and a third, which is peculiar to foetal life and is called *ductus arteriosus*, opens directly into the descending aorta. In the cut (Fig. 75) 1 represents the umbilical cord; 3, umbilical vein divided into three branches, two (4 4) to be distributed to the liver and one (5), ductus venosus, which enters the inferior vena cava (6); 7, portal vein uniting with the right hepatic branch; 8, right auricle—course of blood denoted by the arrow, proceeding from 8 to 9, left auricle; 10, left ventricle—the blood follows the course of the arrow to the arch of the aorta (11); arrows 12 and 13 indicate the return of the blood from the head and



CIRCULATION OF THE FŒTUS.

upper extremities through the jugular vein and the subclavian veins, to the superior vena cava (14), to the right auricle

(8), and following the direction of the arrow through the right ventricle (15), to the pulmonary artery (16); 17, ductus arteriosus, the offsets at each side are the right and left pulmonary arteries cut off; descending aorta (18 18); umbilical arteries (19); external iliacs (20). The arrows at the termination of these vessels mark the return of the venous blood by veins to the inferior cava.

The *Umbilical Arteries* arise from the internal iliacs, and passing by the sides of the bladder, on the outside of the peritoneum, perforate the umbilicus and proceed to the umbilical cord and placenta. The *umbilical vein* (which conveys the blood from the placenta to the foetus) arises from the radicles in the substance of the placenta. It enters the umbilicus, and passing toward the inferior surface of the liver, unites with the left branch of the vena porta hepatica, where is a vessel called *ductus venosus*, opening into the vena cava inferior. Only a part of the blood of the umbilical vein is emptied into the liver.

AERATION OF BLOOD IN THE PLACENTA.—The placenta is the lungs of the foetus; in fact, it represents, physiologically, both the respiratory and digestive organs of the adult. During the whole period of embryonic life the decarbonization of the blood is accomplished in the placenta. The impure blood is brought from the system of the foetus to the placenta, through the umbilical arteries, as already explained. Although there is supposed to be no direct communication between the vessels of the two surfaces of the placenta, the umbilical arteries ramify and anastomose with the radicles of the umbilical vein on the foetal surface; indeed, as in all parts of the capillary system, the arteries and veins become so intimately blended as to baffle the researches of the anatomist, even when aided with the microscope. But, although the structural arrangement of capillary vessels can not be very satisfactorily traced, there is no question concerning the changes which the blood undergoes in them. In the lungs of the

adult the blood expels its carbonic acid gas, and probably receives more or less oxygen from the atmosphere. In the placenta of the foetus the same process is performed. The foetal blood imparts its accumulated carbonic acid gas, and receives oxygen or vital air. BEDFORD regards this interchange of elements as an "endosmotic process." The effete material passes into the vessels of the mother, to be purified from her system through the usual channels, while her own arterial blood supplies the elements necessary for the sustenance and growth of the foetus.

This view of the connection of the circulation of mother and child, and of the dependence of the foetus on the mother for oxygenation and purification, suggests an important practical consideration. If the mother does not breathe sufficiently the child must suffer. Many a mother gives birth to a frail, scrofulous child for no reason except that during the period of gestation she is too sedentary and plethoric. I have known women of vigorous constitutions, who had given birth to several healthy children, become the mothers of children so puny and scrofulous that it was impossible for them to be raised to adult age. In many such cases the child has not vitality enough to survive but a few weeks, days or hours. The reason is that the mother is obstructed in her respiratory system, and although she breathes enough to sustain her own organization in fair condition, she does not inhale oxygen enough to supply the needs of the intra-uterine being. Every woman who changes her habits from those of a very active to a very sedentary life, or who becomes suddenly *fat* or plethoric, is liable, if she become pregnant, to produce sickly and malformed offspring. Many "still-births" are explainable on this principle.

Many frail and puny children, born so only because their mothers did not breathe enough, are supposed to have inherited some occult malady from the maternal parent, "taken the mother's disease," and by so doing saved the lives of their mothers. And physicians not unfrequently give counte-

nance to this absurd fallacy. That "the mother throws off her disease on the child," is a common mode of expressing this prevailing fallacy. It ought to be known that although the child may, while in the womb and also while at the breast, be injuriously affected by all the morbid conditions of the mother, its sickness or death does not in any case "carry off" disease or morbid matter from the mother.

CHAPTER IX.

PARTURITION.

PREGNANCY, NORMAL OR ABNORMAL?—In his able work, "The Principles and Practice of Obstetrics," Professor BEDFORD gravely discusses the proposition whether pregnancy is a pathological condition! And he very candidly informs us that the medical profession has entertained conflicting views on this subject. I should as soon think of arguing whether eating or drinking was a pathological action, or whether sleeping or growing was a pathological condition! The Professor reasons to the common sense conclusion, but expresses it with a qualification better calculated to stultify than to enforce his argument. "So far, then, from regarding gestation as a pathological state, we maintain that, as a general principle, it is entitled to be denominated *a period of increased health.*" In another place the Professor says, "Pregnancy can not, strictly speaking, be regarded as a pathological or diseased state." Such "confusion of tongues" is attributable to the false notions of the medical profession concerning the essential nature of disease. Until it can determine the problem which it confesses itself unable to solve—the nature of disease—and draw the line of demarkation between normal and abnormal actions more clearly, we need not be surprised that medical authors do not very well agree whether certain functional processes, which seem to occur in the order of Nature — menstruation, pregnancy, lactation, dentition, puberty, etc. — are physiological or pathological states or conditions. And when we consider how much disease and suffering attends these eras of progressive life, we hardly wonder that physicians have practically recognized these

processes themselves as morbid, and treated them accordingly.

A woman may be healthy, or she may be sickly, during gestation, as she may be at any other time during life. And this statement is not a "general principle," but a universal law. Nor can pregnancy be regarded as either a state of increased or decreased health. It may be attended with either; but it is not necessarily one or the other.

RATIONALE OF LABOR.—*Why* the uterus expels its contents at or near the completion of nine calendar months from the date of conception, may be as difficult to explain as would be the problem why the average height of human beings is a little more than five feet, or why the earth revolves on its axes in just twenty-four hours. For all practical purposes it is enough to know that such is the law of reproduction. At that time the foetus is capable of independent existence, and at that time the uterus has acquired the organic development and sensibilities which enable it to perform the momentous work of ushering into this breathing world another immortal being "made in the imago of God," and partaking more or less of the peculiar qualities of its earthly parents, its muscular fibres contract, its cavity is diminished, and its contents are expelled.

So true, so admirable, and so energetic are the manifestations of the vital instincts of the uterus on this occasion, that they seem almost like intelligences. But, as the majority of women in civilized life are sadly disordered in the sexual organism, childbirth is usually attended with great pain, and often with excruciating agony, so that the medical philosopher who could entertain for a moment the notion that pregnancy *might* be a pathological state, might as reasonably conclude that parturition *must* be an abnormal or morbid process!

When the foetus is expelled from its uterine cavity, before the period of viability, the process is termed *abortion* or *miscarriage*—the term abortion being usually limited to the period pre-

ceding quickening. When the expulsion occurs during the seventh or eighth month, it is termed *premature labor*.

Says DUNGLISON: "With respect to the causes that give rise to the extrusion, we are in utter darkness. It is in truth as inexplicable as any of the other instinctive operations of the living machine. Our knowledge appears to be limited to the fact, that when the fœtus has undergone a certain degree of development, and the uterus a corresponding distention and organic changes, its contractility is called into action, and the uterine contents are beautifully and systematically expelled."

The action of the uterus in expelling the fœtus is quite analogous to that of the alimentary canal in expelling its contents. In each case the abdominal muscles powerfully co-operate with the peristaltic contractions of the organ. It is true that uterine contractions, when once established, may continue, vigorously, too, with little action of the respiratory muscles of the mother; but ordinarily the force of one of these actions is measured very precisely by that of the other. When chloroform, which occasions a greatly diminished action of the respiratory system, is administered to diminish pain or produce relaxation of the sphincter muscles, the uterine contractions are generally but little disturbed, and in some instances, considerably intensified. Ergot, and many other drugs, as is well known to accoucheurs, if administered at any time after the occurrence of "true labor pains," will generally occasion increased force of uterine contraction, and thus expedite the process of delivery.

But the true explanation, the "*modus operandi*," is very different from that which is given in the *Materia Medica* and the *Midwiferies*. In medical works we are taught that these drugs act on the gravid uterus in virtue of a "special" or "selective affinity." There is a world of delusion in this doctrine, and the malpractice and misery which result from it are incalculable. The truth is, the drugs do not act at all, and have no affinity of any kind, but, on the contrary, there is an unalterable and eternal repugnance to the poison on the

part of the uterus, as there is between all living structures and all poisons; and in virtue of this antagonism or antipathy on the part of the living system to whatever is abnormal, or injurious, or non-usable, each organ resists and expels all such materials in the best manner it can under the circumstances. Thus the stomach rejects and expels a particular drug by the act of vomiting, and medical authors inform us consistently with their theory, that the drug acts on the stomach. The action is all on the other side, and it is precisely so in the case of what are called ecbolic or parturifacient medicines. The uterus recognizes them as enemies or poisons, and manifests its repugnance to them in the only manner possible—an increased and inordinate contraction of its muscular fibres.

On the theory I have indicated it is quite easy to understand the rationale of another fact, with which many physicians are quite familiar, viz., the liability of pregnant women to abort or miscarry when drugged with quinine, tartar emetic, calomel, or any other potent poison, during a course of fever.

RATIONALE OF LABOR PAINS.—By the term, *labor pain*, the obstetrician understands a single contraction of the muscular fibres of the body of the uterus. The pains of labor, other circumstances being equal, in length and severity, correspond to the force and duration of each contractile effort. The muscular fibres of the uterus are so arranged that, while each contraction diminishes the cavity of the organ, it at the same time dilates its mouth. Each contraction or pain continues but a short time, usually only a few seconds, and is followed by an equal or longer period of relaxation or repose. By these repeated contractions the foetus is gradually pressed against the os uteri, which continually enlarges until the dilatation is sufficient to admit of the passage of the foetus into the world.

In *true labor pains* the longitudinal fibres of the muscular coat of the uterus contract from above downward while the

respiratory and abdominal muscles co-operate, inducing a pressure upon the whole abdominal and pelvic viscera, attended with a sense of "bearing down." The patient is often directed to "help the pains," by which is meant that she should hold her breath during the uterine contraction and make a bearing down effort. It is rarely in the power of the woman to suspend or materially abate the "pains" by any effort of will, although narcotic drugs, mental shocks, bleeding, opiates, etc., will frequently suspend them for a time. When the pains are not of the bearing down kind, but irregular and spasmodic, at full term, they are called *false labor pains*. The first contractions of the uterus are generally feeble and the pains slight, when they are termed *preparatory*.

Although the pains attending childbirth are, with the daughters of civilization, usually very great, often terrible, the process is not necessarily attended with any feelings or symptoms to which the term pain will properly apply. In the normal condition the experience is that of *labor* or *travail* rather than pain. And there is certainly no reason, except in abnormal habits and conditions, why parturition should be painful at all. In the ruder states of society, females suffer comparatively very little. And I have attended several cases in which the pain was insignificant—the patients refusing to acknowledge that they suffered actual pain at all. Of course these women did not "live as other folks do," but had been under Hygienic regimen for months before conception occurred.

Many interpret the Scripture expression, "In sorrow shalt thou bring forth," as meaning the arbitrary infliction of pain in childbirth as a penalty for disobedience. But a more rational interpretation, and the only one which harmonizes with the experience of all nations and all ages, is the consciousness of bringing children into a world of wickedness, rendered such by transgression, inheriting dispositions to vice and predispositions to disease from their parents.

There are very few adult females in civilized society not to a

greater or less extent the subjects of uterine disease. There are very few married women who do not suffer more or less of congestion and inflammation of the sexual organs, and a large proportion, which is constantly increasing, are affected with ulcerations or displacements. And when to these causes we add the dyspeptic stomachs, constipated bowels, and weak abdominal muscles, we have a sufficient explanation of the dreaded sufferings of gestation, and the dreadful pains and perils of parturition.

FIG. 76.



NORMAL POSITION.

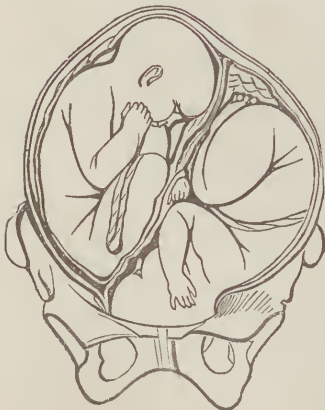
NATURAL LABOR.—Fig. 76 shows the position of the foetus in the best position for delivery. In the works on Midwifery all labors are termed *natural* when the head, face, feet or breech presents, because in all of these positions the delivery may be accomplished without assistance; while all other presentations require manual or instrumental aid, and are termed *preternatural*. But with Nature *normal* and *best* are synonymous terms, and hence the position in which the posterior fontanelle or back part of the crown of the head occupies the

anterior portion of the pelvic cavity, is the only one that can be regarded as strictly natural.

Preceding labor for a day or two there is generally a discharge of a mucous fluid from the vagina, often streaked with blood. This is called the *show*, and indicates more or less dilatation of the mouth of the womb—the precursor of labor. At this time the os uteri will be found, on examination, to enlarge more or less with every pain, and its edges to be gradually becoming thinner. At first the pains are apt to be *grinding* or *scattered*, and to affect more especially the loins and abdomen. After a longer or shorter period they commence in the loins and *bear down*, toward the os uteri. In due time the membranes which inclose the fœtus, with their contained fluid, protrude through the os uteri, the pouch thus formed being termed the *bag of waters*. The uterine contractions soon rupture the protruding membranes; the waters are discharged; the uterus then contracts firmly upon the body of the fœtus, and labor usually progresses rapidly to completion.

The pulsations of the umbilical cord can be felt for a few

FIG. 77.



CASE OF TWINS.

seconds, sometimes for a few minutes after birth, but as soon as the lungs are duly expanded—usually indicated by a *lusty squall*, which every mother and midwife is so fond of hearing—the circulation of the cord ceases entirely, when it may be severed, and the “little stranger” wrapped in a soft blanket and put in a safe place to enjoy the thing it most needs after its first crying spell—a good long sleep.

After the birth of the child the mother has an interval of repose—usually from ten to

thirty minutes, but in some cases extending to several hours—when slight bearing down pains recur; the uterine contractions are resumed and continued until the placenta and membranes, termed the *secundines* or *after-birth*, are expelled.

In the cases of twins both fœtuses may present by the head, or both by the feet, or one by the head and another by the breech, as represented in Fig. 77.

CHAPTER X.

LACTATION.

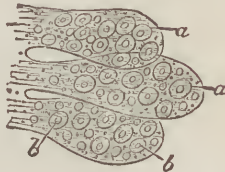
SECRETION OF MILK.—The nutriment of the fœtus is derived directly from the mother's blood; but after birth the child is intended to subsist on its mother's milk until its masticatory organs are developed. The milk is a *secretion* prepared from the elements of the blood in the mammæ or breasts. Each mammary gland is formed of several lobes united by areolar tissue; each lobe is composed of smaller lobules, and each lobule of still smaller bodies, termed *granules* or *acini*. These granules are about the size of poppy seeds, and of a rosy-white color. Figure 78* is a representation of the milk ducts as they appear filled with wax. In the virgin the granules are not distinguishable. The excretory ducts (*tubuli lactiferi*) arise from the granules, and enlarging and uniting with each

Fig. 79.



ORIGIN OF MILK DUCTS.

Fig. 80.



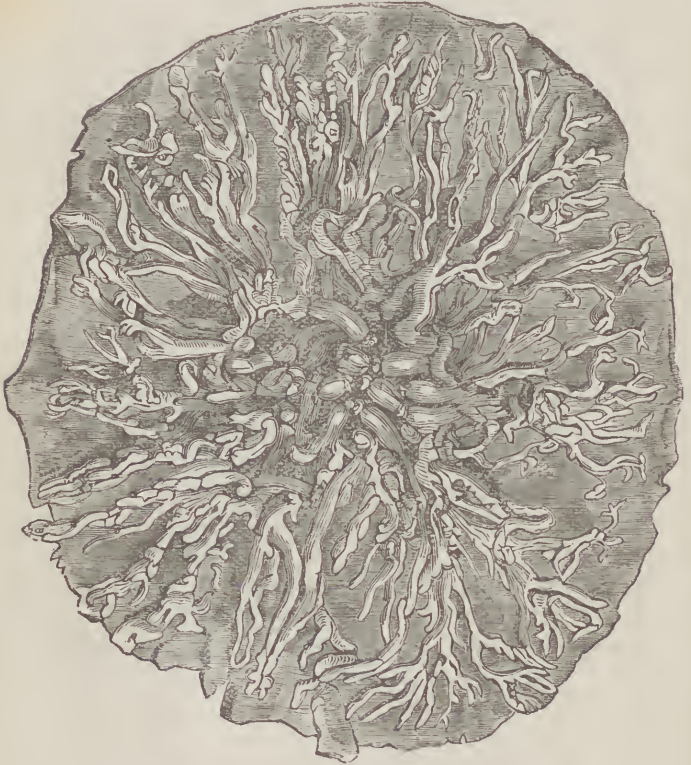
ULTIMATE FOLLICLES OF MAMMARY GLANDS.

other, terminate in reservoirs or sinuses near the base of the nipple. These sinuses are fifteen to twenty in number; and open on the nipple distinct from each other.

The commencement of the milk ducts, as exhibited in a mercurial injection, is shown in Fig. 79. The ultimate

* For illustration see next page.

FIG. 78.



DUCTS IN HUMAN MAMMA.

follicles of the mammary gland are seen in Fig. 80: *a a*, the secreting cells; *b b*, the nuclei.

In some instances milk is secreted and flows from the breasts during the later period of pregnancy; and instances are recorded in which young girls, old women, and even men, have had a copious formation of milk, and have successfully nursed and nourished the young child. The nursing period of woman varies greatly, according to accidental circumstances and habits of life. There can be no doubt that the normal period for nursing the offspring at the breast is as fixed and determinate, in the order of Nature, with the human being as it is with the animals. But the more artificial life of woman has produced more and greater irregularities in this respect. The development of the teeth seems to point to a period of about one year, or a little less, as the proper limit of the function of lactation; yet it is not very uncommon for women to nurse their children for two or three years; and instances have been known in which two or three children, of different births, were nursing at the same breast. The persistent application of the child to the breast, would of course greatly prolong the formation of milk, as the excitement of the mammary gland of the cow, in the process of milking, causes milk to be secreted even up to the moment of giving birth to another offspring.

The first milk is termed *colostrum*, and is supposed to contain more cream and butter and less casein than that which is produced subsequently.

CONSTITUENTS OF MILK.—There is much discrepancy in the results of the many chemical analyses which have been made to determine the constituents of milk, as there always is, and always must be, in all efforts to ascertain the actual constitution of any organic substance by chemical manipulations.

The following analysis, made from milk obtained on the twelfth day after delivery, shows, as far as chemistry can de-

termine the fact, that the difference in the essential qualities of the milk of woman and of other mammals is inconsiderable:

	COW.	GOAT.	SHEEP.	ASS.	MARE.	WOMAN.
Water - - - -	861.0	868.0	856.2	907.0	896.3	905.809
Butter - - - -	38.0	33.2	42.0	12.10	<i>traces.</i>	33.454
Casein - - - -	68.0	40.2	45.0	16.74	16.2	29.111
Sugar of milk and extract- ive matter -	} 29.0	52.8	50.0	} 62.31	87.5	
Fixed Salts -						

QUANTITY AND QUALITY OF MILK.—The amount and character of the mammary secretion are influenced by the quantity and quality of the ingesta, by many conditions of disease, by drugs, medicines, poisons or impurities of any kind taken into the system, and, indeed, by all the habits of life. As the milk is formed from the elements of the blood, and these are derived from the elements of the food, it follows, as a logical sequence, that the welfare of the child is greatly dependent on the dietetic habits of the mother. Every stimulant, narcotic, or condiment—alcohol, opium, tea, coffee, salt, pepper, vinegar, saleratus, etc.—which the mother swallows, irritates her stomach, inflames her blood, and to some extent depraves or poisons her milk and injures her child. Mental shocks, anger, melancholy, and all disagreeable or abnormal mental conditions, render all of the secretions more or less morbid—the milk as well as the rest—and correspondingly damage the child which partakes of the vitiated aliment. Very few children are so fortunate as to pass through the nursing period without being poisoned by the drug medicines which are administered to the mother; and when we take into account the dietetic abominations which constitute three-fourths of what is termed, in fashionable parlance, victuals and drink, we need not wonder that nearly one-half of the

children that are born die in infancy; nor that nearly one-half of the remaining half die in childhood and youth; nor that very few of those who grow up to manhood and womanhood possess sound and vigorous constitutions.

There is one consideration to which, if the attention of mothers and nurses could be properly directed, would, I am sure, have a wholesome influence on their personal habits. During the nursing period the breasts are ready channels through which poisons and impurities are eliminated from the system. Poisons, as opium, alcohol, antimony, calomel, quinine, etc., which do not very seriously affect the mother, or which occasion only what is called their medicinal operation, may be mingled with the milk, or so change its qualities, as to ruin the health and constitution of the child for ever, if it escapes immediate death.

DUNGLISON says: "The milk is apt to be impregnated with heterogeneous matters taken up from the digestive canal. The milk and butter of cows indicate unequivocally the character of their pasturage, especially if they have fed on turnip, wild onion, etc. Medicine given to the mother may in this way act upon the infant. Serious, almost fatal, narcotism was induced in the infant of a professional friend of the author, by a dose of morphia administered to his wife."

One prolific source of infantile mortality in nearly all the large cities on the globe, and in many country places, is the fictitious or adulterated milk which is distributed among the people. In New York and its vicinity for example, thousands of cows are kept in unclean and unventilated stables, fed on the hot slops of the distilleries, and the "swill-milk" which they produce is sold to the citizens and fed to the children. These cows soon become scrofulous, their livers measly, their lungs tuberculated, their teeth carious, their glands ulcerous, and their flesh semi-putrescent, and their mammary secretion—which is quite as much an *excretion* as a secretion—conveys to all who swallow it the elements of disease and death. And although these facts are well known to the authorities, the

nefarious traffic is allowed to go on as though the "protection of persons" was no part of the business of Government, when such protection interfered with the *right* of rich men to become richer!

LACTATION AND PREGNANCY.—Although the female is much less liable to conceive during lactation, yet a free secretion of milk is wholly unreliable as a protection against pregnancy. The recurrence of the menstrual flux is regarded as a sign that the reproductive system is again in a condition for the performance of its function. But, as menstruation may occur during lactation as well as at other times, without hemorrhage, and as hemorrhage may occur without menstruation, this rule is liable to exceptions. Several persons have written me that their wives became pregnant while nursing, and before there had been any appearance of menstruation, which "phenomenon" they desired me to account for. The explanation is self-evident, when we consider that menstruation is simply ovulation. In these cases the menstruation was unattended with the usual hemorrhage, hence the mistake.

Whether the child should be weaned when the menstrual flux occurs, is a subject that has been much discussed by medical writers. The question is one of a choice of evils, and must be decided in view of all the existing circumstances.

In the purely normal condition the cessation of the mammary secretion, the resumption of the process of ovulation, and the development of the masticatory organs of the child, so that it can partake of solid food, are co-incident in time. But it happens that abnormal conditions are the rule, and normal the exceptions; hence mothers and infants must do the best they can. The flux may be a mere hemorrhage, or menstruation itself may not very greatly change the quality of the milk, in which cases it would be better to continue the child at the breast. But if at this time the milk undergoes any appreciable change in quality, or is suddenly greatly diminished in quantity, or if the mother's health declines, the child should be weaned at once.

Analyses of the milk of nursing women when menstruation had returned have been made, but with no very satisfactory results. In 1843 M. RACIBORSKI presented a paper on this subject to the French Academy of Medicine, in which he stated, as the result of chemical investigation, "that the milk of nurses who menstruate during suckling does not sensibly differ in physical, chemical, or microscopic characters, from that of nurses whose catamenia was suspended." He admits, however, that in most cases the milk of menstruating nurses contains less cream during the menstrual period.

In England women of the working classes are in the habit of nursing their children on the average about fifteen months, and Mr. ROBERTSON has expressed the opinion that in seven-eighths of these cases there will be an interval of fifteen months between parturition and subsequent pregnancy, and that, in most cases when suckling is prolonged to twenty months, pregnancy does not take place till after weaning. Dr. LONDON, in a work on the theory of population, advances the opinion that the laws of Nature require lactation to be prolonged for three years; and he thinks that the "antagonism" between the uterus and breast is so great as usually to prevent conception in nursing mothers. But, on the contrary, Drs. ROBERTSON and LAYCOCK have shown by abundant statistics that in about one-third of the cases, conception occurs during lactation.

That conception *should not* occur during lactation is very clear. It is certainly not in accordance with physiological law. Nor is it possible for the woman, while nursing one child, to develop, so perfectly, the ovum for another. Whether she ought to be *exposed* to conception during the nursing period—whether sexual intercourse during the entire period of lactation is not an abuse, and hence abnormal and injurious—I shall consider in a subsequent chapter.

Certain it is that many diseases on the part of the mother, and numerous infirmities and eccentricities, not to say deformities and monstrosities, on the part of the offspring, are attributable to the ordinary habits of free and almost unre-

strained sexual indulgence at the very time when all of the surplus vital force of the mother ought to be appropriated wholly to the nourishment and development of the new being. And it is not a little surprising that works professing to teach Physiology and Hygiene, and especially works on the Diseases of Women and Children, of which the medical press is quite prolific, do not give any instruction on this important subject. Perhaps it is ignored on the score of delicacy, as though it could be indelicate or in any sense improper to teach human beings all things which concern their happiness and welfare.

CHAPTER XI.

THE LAW OF SEX.

THEORIES OF SEX.—No problem in relation to vital organisms has seemed to be wrapped in more impenetrable obscurity than that which determines to sex of offspring. Physiologists in all ages, baffled in all attempts to unfold the mysterious law, or even to fabricate a rational theory, have relinquished the pursuit of its solution in despair. Some have even gone so far as to declare that all attempts to elucidate the correct theory must be vain, as it is one of the secrets of the ALMIGHTY which mortals would never be permitted to comprehend, etc. Such reasoning and such conclusions do not belong to scientific researches. Nature has no works, no processes, either in the organic or inorganic world, which are not determined by exact and irreversible law. The fact that there are two sexes presupposes a cause, and the cause is nothing more nor less than the law—a law of Nature. Because physiologists have not hitherto been able to demonstrate this law, it is vain, if not stupid, to affirm that it may not hereafter be known.

Many theories have been put forward, but most of them are exceedingly chimerical. And since my attention has been devoted specially to this subject, some half a dozen persons have very kindly communicated to me their respective “discoveries,” some of which amounted to nothing more than mere whims, and the others could only be regarded as ingenious but baseless hypotheses.

It is a prevalent notion among the non-professional, and the opinion is countenanced by some authors, that the party who possesses the greater degree of vitality, or whose organic

functions are exercised most vigorously at the time of impregnation, impart or confer the sex of the progeny. But this would be leaving the whole matter to accident or chance; and in the order of Nature there is no such thing as accident or chance. The greater constitutional energy of one parent, or the greater degree of sexual excitement or orgasm, might indeed materially modify the qualities of the child, whether it proved to be male or female; but that this cause can determine or produce the sex is a supposition as gratuitous as it is unreasonable.

The striking similarity between the male and female organs previous to the fourteenth week of foetal life, led TIEDMANN and others to conclude that all embryos are originally female, and that the male is only a superiorly developed sexual apparatus. Other physiologists have maintained that the sexes are originally neuter, the future sex being determined by accidental circumstances in early foetal life. To this it is sufficient to say that Nature knows nothing of "accidental circumstances," while no one will dispute that both sexes are perfectly natural. "Male and female created He them." And whether the God of the Universe has made the conditions, rule, or law, of sex incomprehensible to man's finite capacities or not, it is as certain as any thing can be, that whatever cause or law determines the sex in one case determines it in all cases.

VELPEAU's theory is just the opposite of TIEDMANN's. He regards all embryos as originally male. And still more fanciful is the hypothesis suggested by M. GEOFFREY ST. HILIAIRE, that the difference of sex may be owing to the distribution of the two branches of the spermatic artery; if they proceed together, the one to the testicle and the other to the epididymis, the individual is male; but if they separate, the one going to the ovary and the other to the uterus, the individual is female.

These fallacies, though they have some show of science, are really no less absurd than are a number of the "solutions of the problems" with which I have lately been favored. One

“discoverer” is very sure that the sex is determined in some way by “planetary influences”—conception occurring from 12 m. to midnight resulting in female offspring, the remaining twelve of each twenty-four hours being appropriated to the male gender. Another is perfectly certain that the sex depends on the “points of compass,” and he has sent me a diagram illustrating the various positions of the parties, while in the sexual embrace, which will produce one or the other sex.

THE THEORY OF SIXT.—Several years ago a work in manuscript was submitted to me for examination entitled “An Exposition of the Mysteries of Nature concerning the Generation of Man and the Voluntary Choice of the Sex of the Progeny.” The author was P. F. SIXT, M. D., a practising Physician at Erfurt, Germany. After a critical examination of the reasoning and the facts, I became convinced that the theory advanced was in the main correct, and after submitting it to the test of direct experiment in several instances—all of which resulted in a confirmation of the theory—I purchased the work and published it.

Briefly stated, the theory advanced by SIXT is this: “The organs of the right side, respectively, of the male and female, pertain to the male sex, and the organs of the left side to the female sex. In other words, the right testicle produces male “sperm-cells” and the right ovary produces female “germ-cells,” while the left testicle produces female “sperm-cells” and the left ovary female “germ-cells.” The semen of the right testicle can not impregnate the ovum of the left ovary, nor can the ovum of the right ovary be impregnated with the semen of the left testicle. In order to have coition fruitful, the secretion of the right testicle must come in contact with the ovum of the right ovary, or the secretion of the left testicle must meet with the ovum of the left ovary.

This theory is sufficiently plausible in its statement; and it has a tangible basis—*anatomy* itself. But its truth or fallacy

can only be demonstrated by actual experiment. It was the opinion of HIPPOCRATES that each testicle furnished its peculiar sperm; and others have held that the seed of the one testicle served to fructify the male, and that of the other the female eggs. But, so far as I can discover, SIXT was the first to advance the theory that each ovary contains its peculiar eggs, the right one the male, and the left the female ones. And I am inclined to think, from the result of certain experiments which some of my friends have made at my request, that, if there is any error in the theory of SIXT, it is in relation to the testicles, and not in relation to the ovaries; in other words, if the law of sex resides in either the male or female organs, and not in both, those organs are the ovaries. I shall return to this subject presently.

Says SIXT ("Mysteries of Nature," pages 135 to 139):

"The fact of there being two testicles, induced the great HIPPOCRATES, although he wanted the more recent anatomical experiences, and more perfect knowledge of the female genitals, to infer that each must be intended for a particular use, as there is not in creation, and particularly in the wonderful machinery of the animal body, a single superfluous and useless part. If this, at his time, great man had known that the seed from each testicle has its own receptacle—I allude to the spermatic vesicles—and that, at least in viviparous animals, there are always two ovaries and two Fallopian tubes, he would have been much confirmed in his supposition that each testicle contains its peculiar sperm. But instead of adopting and looking for proofs of his opinion, many thinking themselves wiser, meant to impute to the Creator a far better intention in the number of the testicles and ovaries; some attributing it to symmetry, as if the Creator was bound by its laws, and had not in the blood vessels, and other parts of the head, sufficiently shown that He is not governed by its rule, and as if not, *e. g.*, in many men and animals, one testicle is sometimes retained in the abdomen! Others, perceiving the futility of these assertions, assumed the intention of the Creator to have been in the use, coming much nearer the truth, but supposing it to be confined so far, that after the loss of one another might be left. But well says the great KEPLER, in speaking of the use of the two eggs, in his '*Notæ in Paralipomena ad Vitellionem.*' '*Natura jacturæ nil destinat.*' And it may be questioned whether the Creator, if looking at the possible injury which one might sustain would have acted very wisely in connecting them so closely that

every injury sustained by the one must more or less affect the other? Whether, if the injury to an organ of such importance in the animal economy is had in view, He would not have done better to let them remain within the abdomen? And why, if He contemplated the possible loss of one of them, should He have given to men but a single penis, which is certainly as liable to injury as either testicle, and yet as indispensable in coition as they? In short, this could not have been the intention of an all-wise Creator.

“On applying these two small and supposititious motives in Providence to the female sex, and looking upon them as the cause of the two ovaries and the two Fallopian tubes, the ridiculousness of them becomes still more plain.

“A perfect symmetry has certainly not been contemplated by Providence in regard to the inward parts, though we generally perceive it in the exterior man. This evidences from the position of the large intestines, the disparity in their windings, the irregular course of the blood vessels, etc., and why then should He have been governed by it in relation to the ovaries and Fallopian tubes? And might He not have carried out His purpose in a different manner? Would not every one of those who impute such motives to Providence in constructing a female, according to His notions, rather provide her with a single ovary and a single Fallopian tube, to put out of the way every obstacle to the straight course of the seed as it enters the womb during coition? Providence can not possibly have paid any attention to the probable injuries of these parts in this case either, as the ovaries and Fallopian tubes are too near, as that the one would be likely to escape an injury sustained by the other, not taking into consideration that He has of other even more vital parts created but a single one, as *e. g.*, one heart, one gall, one bladder, etc., and yet man may live without cohabitation, but may not cohabit unless living.

“All this seems to justify the assumption that Providence has given to each ovary its peculiar eggs, and to each testicle its peculiar sperm; but that this is not a mere assumption the skeptical will have abundant opportunities of ascertaining, by making experiments upon animals, as, *e. g.*, dogs, cats, rabbits, etc.”

EXPERIMENTS.—The experiments detailed in the work alluded to (“Mysteries of Nature”) are so interesting, and the argument of the author so satisfactory, that I copy the whole of it in his own words.

“ APPARENTLY CONTRADICTIONARY EXPERIENCES AND THEIR
REFUTATION.

“ But it will be objected, We have been taught by experience in men and animals that this is all false!

“ But of what kind is this pretended experience? WOLF, in his previously quoted work (§ 185) has an argument on this point, not exactly to be recommended for a display of sound logic, of which, not to be detained by his quotations and authorities, which are not entitled to much credit, I shall here give a specimen. ‘ There are,’ he says, ‘ many instances on record of men who, having but one testicle, still begat children.’ The capacity of generating children has never been disputed in men having but one testicle, but only their inability of begetting children of both sexes has been maintained, and this statement remains unshaken by his observation, as he never alluded to the sex of those children nor mentioned which testicle those men had been deprived of; facts which it would have been incumbent on him to inquire into, before attempting to controvert an opinion the extent and bearings of which he seems to have misunderstood entirely. If he seems to take for something new the fact, that man with but one testicle is still capable of generating children, it does not show off to much advantage his profundity of study nor the extent of his readings, for he might have found a number of observations to that effect in a great many works on this topic. GRAAF, *e. g.*, speaks of a man well known to him who begat four children though he had but one testicle, but also fails to notice the sex of those children, and which testicle he had lost, in consequence of injury, or whether he was born with one only, in which latter case it would be probable that the other was retained in the abdomen; for it is well known to practitioners that there are men both testicles of whom never descended from it, they being apparently without them, and it was therefore an unpardonable offense in GRAAF not to examine into this matter after the death of the man. ‘ If it was tried to criminate the wife,’ he continues, in the same place, ‘ such instances are not uncommon even in animals which have propagated their species, though the male had one testicle cut out.’

“ To this my reply is, that even if young ones of both sexes had been generated, which, however, is not expressed, there can be no guaranty for the abstinence of the unrestrained female, as little as for the fidelity of the wife of that invalid, a case which is referred to by many physicians, who having lost one testicle by a rifle shot, nevertheless begat a number of children, although even in this instance their sex is not alluded to.

“ As to the experiment of VERREYEN, quoted by WOLF, which is stated

to have been made upon a horse, it seems to me wanting of the proper caution and accuracy, as I have in my possession, besides that of two intelligent farmers, the opposite evidence of the Royal Danish Regimental Veterinary Surgeon, Mr. SANDER, who, if not entitled to any credit by his position, has been cautious enough to secure the testimony of the Colonel and Captain of his regiment, and I shall leave the reader to judge between them. 'There has been,' he says, 'for three or four years, among the horses of the regiment, in spite of all endeavors, and to the regret of the General, some pregnant steeds always after the time of pasture. It was known that as this had been the case several times at the same season, and the watch was particularly active, no strange horses had been admitted to the pasture grounds, and Mr. SANDER tried to get at the bottom of the matter, in which he was finally successful, for he found that among the horses of the regiment there was an old stallion, whose right testicle had been taken out, and also that the colts generated by him were mares every one of them.' This observation, however, isolated as it is, is hardly to be considered a sufficient support of my position, as in the mentioned instance the generation of female colts only might be said to have been casual, unless corroborated by further experience and observations of a similar nature.

“FURTHER EXPERIENCES IN SUPPORT OF THE POSITION THAT EACH TESTICLE CONTAINS ITS PECULIAR SPERM, AND EACH OVARY ITS PECULIAR EGGS.

“Dr. BELHING, at Hildesheim, in 1736, made an experiment most favorable to my position. 'I found,' he says, 'in a woman who had died in her labors and previously borne nine boys, having never had a girl, on dissecting her, the right ovary sound and perfect, but the left lean, emaciated, and collapsed, so as to present the appearance of a tissue of dried-up cuticles only.

“Moreover, Dr. RULLMANN found in a courier of the Prince of Dalberg, who died in 1790, and was dissected at his instance by the prosecutor of the University, Dr. THILOW, the left testicle to be entirely indurated, shriveled up, and grown together in the inside, in such a manner that the preparation of the seed could not possibly be performed by it. This man had been treated by him before his marriage for an injury of the left testicle by a fall on a railing; and the operation proposed by Dr. RULLMANN being resisted by him, although he was but a young man, the Doctor succeeded in curing him at the cost of fertility in that testicle, as was afterward proved by the dissection. A few months after his recovery he married a young widow with two daughters, and with her

he begat five boys, whom I know myself, and who are alive at the present writing.

“This striking observation, moreover, as it was published by Dr. THILLOW, ought to have engaged the attention, at least, of anatomists and physiologists, and encouraged them to make experiments, yet they stuck to the generally received opinion with a tenacity and stubbornness that are symptoms of an inert mind only. Some of them tried to oppose to BELHING’s experience another one of CYPRIAN, who cut a fœtus out of the right Fallopian tube in a woman who, surviving the operation, afterward bore girls and boys. Hence they drew a very inconsiderate conclusion, viz., that the right Fallopian tube had been disabled by the operation, wherefore the right ovary could not have any more eggs detached from it. If I were to draw any such inference, would not the whole Faculty put me down an *ignoramus*, because I dared attempt to found a new system and to overthrow the old ones? Would it not have been proper after the death of the woman to examine the right Fallopian tube and ovary, instead of relying upon a deceptive conclusion in so important a matter? and was it never known before that an operation was performed upon a part of the human system, in consequence of which that part was nevertheless not disabled for use? How easily might a dissection have given the lie to those syllogistical gentlemen! The other case, as far as known to me, has never been called into question, perhaps because they were aware that they would have to contend with men able to plead their own cause.

“Surely, if any thing has kept them from making personal observations, it could only be the prejudicial opinion that HIPPOCRATES had made a mistake, which gained ground the more easily as there seems to be a general dislike prevailing among the half-bred to oppose the views advanced by eminent men. Truly, it did not require a little consideration to induce me to continue my experiments, as the opinion of HIPPOCRATES had been so loudly and universally decried.

“MY EXPERIMENTS AND THEIR ORIGIN.

“An incident induced me to resort to experiments long before resolved upon, for the purpose of obtaining either personal evidence of the truth of the generally received opinion, that both testicles contain the same kind of sperm, or to rid myself of a conception which I had already for some time considered an erroneous one. And since this incident has been of so much influence upon my subsequent researches, I think that a full report of it will not be amiss here. It is this: In the spring of 1785 I bought two young castrated boars, for the purpose of fattening them and having them slaughtered in March following. After some

time, when they had grown a little, I perceived that the left testicle in one of them was still in the scrotum. Instead of being vexed at this, and taking it away, too, I was very glad, and instantly resolved to avail myself of the opportunity for testing the opinion whether each testicle has its peculiar sperm. For that purpose I bought a sow, which was carefully attended under my special superintendence, having a lock made to the sty, of which I myself kept the key, so that nobody but myself could possibly enter it.

“In the month of August, symptoms of the sexual disposition became manifest in the sow, on perceiving which I immediately introduced my half-castrated boar to her. Coition went off satisfactorily under my very eyes. The sow became pregnant, and my expectations were most sanguine. In the month of December my sow gave birth to eight pigs, females without exception. It was then that I was relieved from an anxiety and excitement always felt during a state of uncertainty, and in my case in particular, since there was now no occasion to give up an idea which I had become greatly prepossessed in favor of. Still I was not perfectly satisfied, trying rather to account for the birth of female pigs only in any way I could think of, and even ascribing it to incident, for the want of assigning a better reason. I therefore spared the boar for repeating my experiments, carefully feeding him as well as the sow, of which I took particular care in preventing her from associating with other swine; and whenever the preservation of her health required her being let out of the sty, her excursions were confined to my yard, which she could not get out of. In March of 1786 the sow again evinced a sexual disposition. I immediately let in the boar, then one year old, and after having cohabited with her she gave, in July, precisely at the proper time, birth to eleven live pigs, one and all of the sex of the mother. After this there was nothing more natural than that I should extend my experiments, to elevate my favorite idea beyond the shadow of a doubt, for which purpose, and to obviate being accused of partiality and misrepresentations, I prevailed upon some of my friends and acquaintances to engage in the same pursuits, and to communicate to me their results.

“My own further experiments were made principally upon dogs, after I had previously castrated them myself. In the first place, I took three dogs of so many different breeds, among which was one bastard, and having cut out on the 2d of September, in 1786, the right testicle of each, I associated with two of them a female of their respective breeds, and with the bastard a female as nearly like him as I could procure. I kept each couple with the greatest care in a separate chamber, of which I alone had the keys, always feeding them myself, and withal I was so cautious in my undertaking as to deny access to their chambers even to

my most intimate friends. I do expressly state all these particulars to avoid the slightest suspicion of carelessness or inattention, and because I think that it must be in the interest of every physiologist to be made sure that no mistakes have been made.

“It took a long while before my eunuchs showed any disposition for cohabitation, and my curiosity was put to a severe trial. The bastard finally cohabited with his female on the 8th of January, in 1787, and on the 12th of March she gave birth to eight young sluts. One of the other two became connected with his female on the 20th of January, and on the 24th of March she had seven young ones, all of her sex; the other did not associate with his slut before the 23d of February, and she on the 28th of April bore four female young ones. Still, not satisfied yet, I kept my dogs locked up until they became hot again. This took place with the first on the 6th of August, with the slut that had been associated with the bastard on the 13th, and on the 7th of October the former again bore five, and on the 13th the latter seven female young ones; the third never was hot again, however well I might feed her.

“At the same time that I made these experiments upon dogs, I also caused three rabbits, after having cut out the right testicle in each, to be locked up with three females in a chamber, the floor of which was laid with flags. At what particular time, however, the rabbits did fructify their females, I could not discover, in spite of all attention, as the male ones were so frequently seen to be jumping on the females. I could not, therefore, exactly state the date of their conception and delivery. This much, however, I can assure, that throughout the summer of 1787 I received almost every five or six weeks an addition to their family of none but female young ones, which, as soon as they were done sucking, I immediately took away from them; which experiments in relation to them will be confirmed by the cotemporary ones of the Superintendent of Forests, Mr. HOTZLER, at Fredenthal, near Gotha, made at my instigation.

“At this period I recollected the passage from the Bible, where JACOB, to get variegated lambs, is said to have tied variegated staves to them. Fully aware, as I am, that there are thousands who are treating the Bible with the most supercilious contempt, my curiosity had long been excited by the passage referred to, and thus an opportunity offering itself to test its truth, I resolved to make an experiment which I think worthy of being communicated here, although it does not properly come within our scope. I spread blue cloaks, and whatever I had of blue cloth in the house, over the floor of the room in which my rabbits were, in such a manner that they always had to pass over some of the blue pieces if they wanted to get into their holes, and I also frequently chased them across the blue carpet. After some time, two of the females being then

pregnant, bore, to my utter astonishment, dark-blue young ones, which in their turn had young ones of the same color. I know very well that many will laugh and sneer at this experiment, as well as at the story of the colored staves of JACOB, because they deny the agency of imagination altogether, resting themselves on some unsuccessful experiments. I also know that self-love will rather in most cases determine us to a flat denial of any thing which we have not seen or experienced ourselves, than admit the possibility of any defect or imperfection in our personal experiments.

“Again, on the 22d of September, in 1787, I caused two dogs, one of them being a bastard, which had their left testicles taken out, to be looked up separately with one female, taking the same care in their keeping as in the former cases. This time I had not to wait so long before they cohabited, which the bastard did on the 11th of December of the same year, the female bearing six male young ones on the 13th of February, in 1788. The other dog covered his slut on the 7th of January, in 1788, and she brought eight male young ones on the 12th of March. In the same manner I tried the experiment upon rabbits in the summer of 1788, and I got none but male young ones from the cohabitations of females with males that had been deprived of the left testicle.

“In the same year I made experiments upon cocks, some of which had the right testicle taken out, and some the left one, taking still greater care in confining them together with one hen, and I always obtained the same results. Two hens, however, had rotten eggs, which I could not sufficiently account for, although on killing and dissecting the cock that had been confined with one of these, the eggs of which were rotten, I found his remaining testicle to be very much inflamed, yet I am far, however probable it may appear, from referring to this circumstance as the true cause, inasmuch as I could not possibly know whether this morbid state of the remaining testicle was existing already at the time of cohabitation.

“Still more encouraged by the flattering results of my experiments, I began to castrate female animals, also, an operation very troublesome to me and fatal to most of the subjects. Two sluts only got over it, in spite of all efforts on my part. On the 17th of August, in 1788, I took from each of them the right ovary and the right Fallopian tube, and this pair was the only one surviving the operation.

“After some time the sexual disposition showed itself in both, and I then associated them with the males that had lost the right testicle. The slut which had been associated with the bastard was connected with him on the 16th of December, bringing five young ones of her sex on the 18th of February, in 1789; the other having cohabited with her partner

on the 11th of January, in 1789, bore seven young ones, all females, on the 14th of March. The next time, I introduced a perfect male having both testicles to her, but when her time came, there was not a single male among her four young ones. To the other I put a male having the right testicle only. Coition took place in September, but although her sexual disposition left her, and I therefore concluded that she was pregnant, and thus took my previous supposition, that each ovary is fructified by its own testicle, to be unfounded, I soon found that the coition was not fertile, and that she had not conceived, as no gravidity nor delivery ever took place.

“ In subsequently repeating my experiments, and the last one in particular, I always obtained the same results, so that I at last thought it useless to note down every thing. Besides, it will not be difficult for a still doubtful reader to make any of these experiments himself, and if proceeding with the proper caution, he will find his results to correspond with mine. In females the thing is not quite so easy as in males, and it is requisite to keep them well to prevent their meeting with other males besides the one intended for them.

“ But I do not consider it superfluous to subjoin here a letter from the before-mentioned Superintendent of Forests, Mr. HOTZLER :

“ FREDENTHAL, NEAR GOTHA, *December 16, 1791.*

“ MY DEAR FRIEND—It is but justice to you and myself which induces me to communicate to you the results of my experiments made at your instance. I might have done so already last summer, when I became so firmly convinced as to give them up, but you know that we sportsmen are very much engaged all summer, and that being mostly on our legs throughout the year, we are rather unused to, as well as unfit for, correspondence. To detail, however, each particular case, would make up a pretty decent volume, and you would thus be detained still longer, therefore may it please you to accept a summary statement of my results. I would remark, however, that in all experiments undertaken by myself, at first at your instance, but afterward from personal interest, I called in the assistance of Dr. PEZOLD, at Muhlberg, a respectable physician, and to whom I am greatly indebted for his efforts.

“ From the time that you first applied to me, three years ago, I have made, on the whole, thirty-one experiments, seven of which were unsuccessful, or rather not attended by any result, the females appearing to be barren; in four of them disease seems to have been the cause of it; in the remaining three cases we could not assign any reason whatever

“ Six pairs of dogs were castrated by us in different ways, some of the males having the right testicle taken out, others the left one, and some

of the females having the left, and others the right ovary cut out. The results obtained were as follows:

“1. All males that had lost the right testicle begat female young ones only.

“2. Those the left testicle of which had been taken away generated males only.

“3. Precisely the same it was with the females, which bore, according to the loss of the right or left ovary, female young ones only in the former, and none but males in the latter case. I have to notice, however, that out of seven sluts four only survived, one of which never became hot.

“4. That, in spite of all efforts, no slut became pregnant if put to a male, the loss of the testicle in which did not correspond with her missing ovary. We made the same experiments upon rabbits, obtaining the same results, and Dr. PEZOLD has besides castrated three cocks and two tomcats, which latter, to the sore grievance of the peasantry at Muhlberg, do not breed any but he-cats; and this I believe will be satisfactory to you.

“And though, in conclusion, my letter is rather short and abrupt, do not think my experiments to have been of the same description, for I have indeed spent much time in making them, as I am a great deal more fond of investigating matters in natural economy than of arguing them on paper, a task which sportsmen are spoiled for,’ etc. etc.

“CONCLUSIONS FROM THESE EXPERIMENTS, FURTHER OBJECTIONS TO THEM, AND THEIR REMOVAL.

“From all these experiences, I believe to be justified in the following conclusions:

“1. Each testicle secerns and contains its peculiar sperm.

“2. Each ovary contains its peculiar eggs, the right one the male, and the left the female ones.

“3. The seed from the right testicle is capable only of fructifying the eggs of the right ovary, and that of the left, those of the left ovary alone.

“If it was objected to this, that the first position has been taken already by HIPPOCRATES and many others, and the second, among others, in particular, by JOHN JACOB FRANCIS VIKARIUS, I can truly assert, that at the time when I first undertook my experiments I knew nothing about the views of either on this subject, having been made acquainted with them afterward, when I perceived the necessity of perusing all known systems of generation. Besides, their views are but opinions unsupported

by any experience, resting upon mere reasoning; and of those opinions there is such a number, that it is by no means surprising if one out of the many should come near the truth. If, however, I should be absolutely denied the merit of having given a mature consideration to the subject, and my confession of not having read any thing on this subject should still be disbelieved, I might ask, whether the powerful opposition prevailing against this opinion would not have rather tended to deter me, as it had done every body else, from my undertaking, and to shake my belief, instead of encouraging me? Whether there ever existed among the great number of opponents a single one to take the trouble of making experiments like myself, to ascertain the truth if possible? Whether there had not been for centuries as much chance for castrating animals as I had, and whether the scientific would not have done better to avail themselves of the opportunity instead of relying on the innovations of a few of the leading men, and their imperfect or even pretended experiments? Whether, lastly, any one ever thought of the third position, and could have shown any cause for it, without the experiments made by me? But why be detained any longer by such insignificant trifles? as I am confident that every truly learned man will, if not recognizing any particular merit in my endeavors, at least not look upon them with an envious eye. Be this as it may, I shall now proceed to notice some objections, at least supposed to be such, that might be raised, and try my best to invalidate them.

“FIRST OBJECTION TAKEN FROM THE EQUALITY OF MATTER INTRODUCED INTO BOTH TESTICLES, THEIR EQUAL STRUCTURE, AND THE EFFUSION FROM BOTH SPERMATIC VESICLES AND CONSEQUENT COMMIXTURE OF THE SEED, WITH THEIR REFUTATION.

“*First Objection.*—On dissecting the testicles, it has frequently been noticed that the blood vessels of the left were much larger than those of the right, in consequence of which its vitality must be proportionally increased; the more so, on account of being found much larger, stronger, and filled with a greater quantity of seed than the right; wherefore it was to be supposed that the seed prepared by the left testicle was requisite for the generation of the male sex. That, however, neither testicle bore any relation to a particular sex, was evident from the fact that all vessels carrying the fluid to the testicles, which they are to prepare further, and to change into seed, originate from the aorta, wherefore they must introduce equal matter and equal blood; moreover, both testicles and epididymides consist of the same kind of circumvolving ducts or vessels, as may be seen by maceration, and likewise the spermatic vesicles, in

which the seed in most viviparous animals is preserved, are perfectly alike, and of the same quality.

“To this my reply is briefly as follows: I have expressly stated at the outset, whence the seed originates, and there shown that it is principally prepared from the blood supplied by the aorta, therefore I will only remark, that from the same blood, which is carried to the head by the well-known arteries, as well the gum of the ears as that of the eyes and the mucus of the nose, is prepared by the respective vessels, which shows that different secretions from equal matter depend merely upon the difference of preparation.

“Secondly: The inference from the equality of the exterior appearance upon the equality of interior structure, I should beg leave to declare very inconsiderate, and entirely inadmissible. For no anatomist will ever have the self-assurance to assert his ability to minutely examine the structure of the innumerable, diminutive vessels traversing the testicles in every direction, and preparing the seed, much the less that he had once actually done so and been successful. Still better, I think, will the falsity of the inference from equality of exterior appearance upon equality of interior structure be illustrated by way of comparison. A man may fancy, *c. g.*, on seeing two watches with their cases perfectly alike, of the same size and shape, and having a metal plate in place of the glass to cover the dial, that their work and price would be the same, too; yet who is there to say that he might not be mistaken after opening and inspecting them inside. This will apply equally well to the vessels of the testicles, until now the equality of the interior structure having been supposed merely by anatomists. But even admitting that their interior structure is the same in both testicles, might not a slight difference in the epididymides, so slight as to escape the keenest sight, be sufficient to change the quality of the seed, and thus to fulfill the intention of Providence? Might not the various ramifications into which the spermatic arteries branch out upon entering the testicles, produce such a difference from that variety in their being spread about? Might not, lastly, a greater or smaller number of pores, which are generally attributed to the spermatic vesicles, be sufficient to change the nature of the seed in both receptacles? Could not, if we were to go to extremities in conjecturing, even if the vessels of the testicles and epididymides, as well as their ramifications, were perfectly alike in structure, a slight difference of length of their tubes, after they have been rolled up into those fascicles which we call testicles and epididymides, be sufficient to effect a change in the nature of the seed? Does not, more than all reasoning, the manifold experience of Mr. HOTZLER and Dr. PEZOLD, as communicated above, show a difference in the seed of the testicles; as he reports that a dog

which had the right testicle taken from him could not fructify a slut that had the right ovary left only, while a dog with the right testicle alone could do it as well as a perfect one?

“*Second Objection.*—The effusion of the sperm during coition takes place quite mechanically, both being emptied at once in this way; each of the spermatic vesicles in which the prepared seed is kept has its particular outlet into the urethra, called the *caput galli gallinacei*, which prevents the seed projected from one to touch at the other. Each outlet is provided with a small fleshy fold, which closes to prevent the seed coming out prematurely and turning into the urethra, whenever the seed is to be ejaculated. Now, from the friction during coition, the muscular cuticle of both spermatic vesicles is convulsively shaken, so as to become forcibly contracted, and to send their seed into the urethra, previously lubricated by the secretion of the prostate, whence it is ejaculated into the womb, where, after being mixed, it is carried to the ovary for fructifying an egg by way of the Fallopian tubes. If even, therefore, it was of a different nature, it would be rendered ineffectual from its becoming mixed, and Providence would have given to each testicle its peculiar sperm all to no purpose.

“To this apparently most important objection my answer is thus: 1. As it is admitted by the opponents themselves, that the so-called *caput galli gallinacei* prevents the seed projected through one outlet from touching at the other, it must certainly have been for some object that it was so made to prevent, and the most obvious is the simultaneous effusion from both spermatic vesicles; for, secondly, I do absolutely deny that in fertile coition an effusion of seed from both spermatic vesicles takes place, but only from that one of them, the corresponding testicle of which is drawn upward during coition. Here it will be claimed that there is an old story about the testicles being drawn up, but this same old story has afterward been fully proved to be correct, having been described as fabulous, because it did not suit the notions of some who were nevertheless unable to controvert it upon physiological grounds. Is not the capability of the Fallopian tubes to seize and surround the eggs as plainly demonstrated as can be, and has not, nevertheless, the same clamor been raised against it? Therefore I enjoin it upon every friend of truth to take notice whether, at the critical moment during coition, one of the testicles does not become drawn up toward the abdomen, on doing which he will no more consider a matter of fact as a story. It is the delicacy of the subject only that prohibits me from adducing any personal evidence in the premises.

“If it was said that the *musculus cremaster* was acting alike upon both testicles and spermatic vesicles, I would ask, is not this muscle connected

with others, or is it isolated? No anatomist or physiologist could possibly assert the latter, as the muscular connection through the system has been too well established from experience. And if so connected, its motion will be influenced by it, and according to a stronger or less tension or lateral contraction in the muscles with which it is connected, it will likewise suffer a greater or less tension and lateral, or, which is the same, partial contraction. For do we not daily have an opportunity of seeing a larger and more central muscle affect the mobility of a distant but less one? The cremaster will, therefore, I apprehend, make no exception.

“The cause, therefore, of one or the other testicle being drawn up, and the seed, in consequence, being effused in one spermatic vesicle alone, is to be found in the accidental motions of the contiguous abdominal muscles operating more powerfully on one side than on the other, and thus influencing the contractibility of the cremaster; and if this be true, the generation of boys and girls becomes optional, provided it is known how to direct the motions of the cremaster.

“If, further, the objection should be raised, that even admitting a stronger attraction toward the abdomen of one testicle, it does not follow that the seed might not be effused from both spermatic vesicles at once, because they are both affected from the convulsive shock which produces the contraction of the muscular membranes of both by which the seed is projected into the urethra, thence to be ejaculated toward its proper place; and if this be so, it warrants the conclusion that the seed can not be retained by one.

“As nobody will be able to show the reality of my position, I must confine myself to the demonstration of its possibility.

“The muscular membrane, on the contraction of which in both spermatic vesicles this objection is founded, and to which the effusion of the sperm from both is attributed, is, at least in my opinion, as likely to be acted upon, and to be directed in its motions, as the cremaster, and every other muscle of the animal body. Therefore it is by no means improbable to presume that one spermatic vesicle being strained to a greater extent by the larger muscles of the corresponding side with which it is connected, would be more strongly convulsed than the other. Perhaps the action of its muscular membrane depends on the cremaster alone, as experiments will plainly show.

“These experiments, upon which I hit after repeated meditation, will not only seem improbable, but almost impossible to many, although they are not the less true for all that. I was induced, on having an opportunity of turning the conversation upon this subject, to advise some married men of my acquaintance, whose names, however, I am not permitted to divulge, to practice coition for some time in a manner to be described by

me at its proper place hereafter, and in which one and the same testicle is invariably drawn up. They did so, because desirous of being convinced in this particular, upon which, after some time, they found a remarkable decrease of seed. On hearing which I then advised them to change their position in such a manner as to effect the attraction of the other testicle, upon doing which, to their surprise, a copious effusion of sperm took place. Can more satisfactory proofs be demanded in support of the position as taken by me, that the effusion of sperm during a regular coition takes place from one spermatic vesicle only, the one the corresponding testicle of which is drawn up? Is there a stronger argument against the equal degree of convulsive concussion in both spermatic vesicles? Can it be better demonstrated that the degree of this concussion, and the consequent effusion of the spermatic vesicle, depends upon the more powerful pressure of the seed, and the stronger expansion in consequence of it; since, if the objection was true, the vesicle which had gradually become emptied of its seed would naturally be much less liable to expansion than that from which a copious effusion took place afterward? Is it not within the power of every one to go over these experiments and to satisfy himself, after he shall have been informed hereinafter how to proceed about this business? However, I will beforehand protest against the experiments of too young and ardent men, as they would be likely to want the proper self-control and caution at the critical moment, and therefore all rules and precepts would to them be of no use.

“THIRD OBJECTION TAKEN FROM THE IMPOSSIBILITY OF SUPERFEC-
TATION, AND ITS INVALIDATION.

“*Third Objection.*—How often have twins of different sex been born? How often even three at a birth and more, although less frequently, and that, too, of different sex? Do not animals often breed young ones of different sex? and yet they are all conceived at once, because there is only a single and no successive fructification of different eggs. Therefore, it can not be conceded that each testicle has its peculiar sperm, and so on.

“To this objection I have to reply that, in the first place, the question of superfecundation is by no means decided, having ever been a mooted point among medical men, as may be seen in SCHURIG’S ‘Syllepsiones,’ sec. 3, chap. 1, § 4. I shall here transcribe the arguments of both parties as briefly as possible, now and then expressing my own views. Those denying a superfecundation, and among whom there are certainly great men, rest on the following:

“1. The orifice of the womb is immediately closed after fructification has taken place, being sometimes even surrounded with a kind of glue, so that it can not possibly open, and as HIPPOCRATES says, not even admit the point of a dagger.

“2. Whence is to be formed the corium for the second foetus that comes afterward?

“3. If a consecutive conception or superfoetation is assumed, the orifice must certainly open, in which case abortion is generally, if not always, the consequence.

“4. If twins, etc., are born, it is not because two eggs are fructified successively, but by pretty much the same process that takes place in a grain from which several ears have been rising. They often contain several embryos, and if they, on account of copious nutrition, are developed at once, twins are born at once, and perfectly alike one another; but if not developed at the same time, or dying away for want of nutrition, or being retarded in their growth, there will be born crippled, or still-born infants in the former, or perfect infants at a later period in the latter case.

“5. There is no superfoetation in female animals, therefore it can not be presumed in man, as he in this particular is subject to the same rules as animals.

“6. In most cases it is extremely difficult to recognize in twins the one last conceived, and therefore natural to suppose that both have been fructified at once.

“7. Superfoetation can not take place after from three to four, or, at the utmost, thirty days after the first fructification, because afterward the uterus becoming filled more and more by the growing foetus, is still more firmly closed, and thus disabled from receiving any more seed, much the less from retaining and carrying it to the ovaries, yet there are instances of children having been born a month and upward after one another.

“8. Even by law a superfoetation taking place after thirty days is declared an incredibility.

“The defenders of superfoetation counting likewise some great men among their numbers, reply as follows:

“AD. 1.—The uterus is certainly in most cases closed immediately after conception, but this is not always so, as there are women who have their courses during the first period of pregnancy. I know very well that many, from an unjust predilection for the once adopted views, have sought to trace this blood to other channels, but I know equally well that they have not yet found what they have been looking for, nor does it appear to me that to attribute the bloody discharge to exudation is very

plausible. The orifice of the womb opens in very passionate women only, who are most strongly convulsed by coition previous to conception, and therefore superfœtation is so very rare. HIPPOCRATES never said what he is made to say, but has only been misinterpreted.

“AD. 2.—Nature never can want the means to form a second corium, and if but one could be formed in the uterus, where would each twin fructified at the same time get his peculiar corium, umbilical cord, etc., or would they perhaps share the one between themselves in brotherly harmony?

“AD. 3.—That abortion may be caused by unusual excitement in coition after conception, will not be denied by any intelligent physiologist, but only that it must be so in every instance. Has not Professor BLUMENBACH said that no cautious and credible observer will ever have noticed a real embryo before the third week of pregnancy? Have not I myself quoted several authors in the preceding, by whom it has been contended that immediately after coition the egg could not be discovered in the womb, nor even in the Fallopian tubes? May not, therefore, before the egg went into the Fallopian tube, another fructification have taken place from another coition a little while after the first? May it not even happen in the ovaries after the first egg has been taken up by the Fallopian tube? Are not the subsequent fructifications so scarce because the position of the embryo and the state of the womb do mechanically prevent them? Are not the majority of women bearing twins stouter and more passionate than others? Do not sheep of the same breed on exuberant pasture-grounds bring two and three lambs in succession, whereas on sterile soil they hardly ever bear more than a single one; just because from copious food they get stronger and more sensual.

“AD. 4.—If the eggs are developed after the manner of a seed of grain, why does not the birth of twins, or three and more children at once, take place more frequently? Why have not twins, etc., but one corium, one umbilical cord, and one placenta, as the sprouts of grain, no matter how many stalks it may spring up, have all but one common root? Is it not more natural to admit the detachment of several eggs at a time than the plurality of embryos in the single one?

“AD. 5.—To this position I beg leave to except altogether, and to declare it as being absolutely false, and displaying but a slight degree of observative talent; for dogs do almost daily disprove it, as I know from experience; and every owner of a slut who will take the trouble of keeping her properly at her time will be able to do the same. As I recollect some of my experiences on this subject, I shall just mention them here. My neighbor owned a terrier bitch that he did not care much about. She became hot uncommonly often, and if so was always

connected with a number of males of different breeds. On being delivered, which happened just as often, she gave birth to seven, eight, and even more young ones, in every one of which a difference of breed could be plainly traced, some being rough, others quite smooth, some terriers and some pointers, so that it would be ridiculous to suppose all of them to have originated from a single fructification or one male only. Another slut which I had deprived of one ovary I left to associate with several males of different breeds, and she bore young ones, all of one sex to be sure, but of as many different breeds as she had been associated with. To these I might add a number of other instances, but it would only be wasting time and space, therefore I will only say that I have met with so striking varieties among young ones of the same mother, that I could no longer doubt their originating from different males, and in consequence from consecutive fructifications. And since the other party has thought itself entitled to conclude upon men from animals, we may, I think, avail ourselves of the same privilege.

“AD. 6.—In a number of cases one of the twins is a little smaller than the other, and where this is not, superfœtation took place probably within a day, or even a shorter time after the first fructification.

“But where of twins one is born a month after the other, would it not be more natural to suppose a consecutive fructification, instead of attributing the later birth to want of nutrition and a consequent retardation of development. If such twins had a common placenta to prepare the nourishment for them, this opinion would become somewhat probable; or if they, like the sprouts from one grain, became detached from the root one after another, there would be some reason for it, but as each has its own umbilical cord and placenta, there is not the least probability that one (if both conceived at the same time) could detract so much nourishment from the other without stopping its growth entirely. If it was possible at all that a woman upon being dissected had in her womb an indurated fœtus of the size of a large bowling-ball—a case which I shall speak of at more length hereafter—and yet could bear two children in spite of this considerable lump which she distinctly felt herself in her very womb, superfœtation may no more be doubted.

“AD. 7.—The other party does evidently disagree in relation to the time during which they admit a possibility of superfœtation, and this is not a very favorable symptom. The ancient physicians seemed to have rejected it merely because it did not very well correspond with the then generally received system of the crystallization of the seed; and the modern ones in contending that the uterus becomes the more firmly closed as the fœtus is growing, only betray their ignorance of obstetrics. For in the works of SCHURIG, an old author, it may be read that the

orifice of the womb does gradually expand as pregnancy advances, and to-day this is generally understood from an examination of so many pregnant females during the different periods of gravidity. However, that it is generally closed during the first time we have seen before, and this accounts for the scarcity of births at a distance of one month between them.

“AD. 8.—A physiologist can not recognize the authority of civil law in scientific matters, for laws were made from the conceptions of men, and therefore must partake of their nature, right or wrong. The ancient laws furnish the best proofs of this, for what was deemed to be expedient by legislators of former times is now considered an absurdity. Were not formerly, *e. g.*, supposed hermaphrodites required by law to solemnly swear which of their genitals they intended to use, and are we not sufficiently assured now that a perfect hermaphrodite has never existed and never will? Were not formerly many hundreds of unfortunate old women burned at the stake for being suspected of witchcraft, and is not such a proceeding nowadays considered absurd, cruel and barbarous? As little as the law had power to call witches into existence, or the reality of hermaphrodites can be proved by the existence of laws made for them, as little will superfœtation become a miracle because it has been so decreed by law. But to insert all that has been collected by SCHURIG on superfœtation, *pro* and *con*, would swell this work beyond its intended size. Therefore I shall briefly remark, that the majority have been induced to deny superfœtation from a predilection of their adopted system of generation, *as, e. g.*, that of crystallization, alluded to before, the followers of which can not from chemical reasons admit a separate crystallization in two distinct and contiguous bodies; the animalculists are ridiculing the idea that the animalcule, in finding its diminutive hole in the egg, would have to spend weeks on a road traveled by so many thousands of them at the same time, etc. And have not, in the history of medical science, actual experiences been absolutely denied because they did not very well agree with presupposed opinions? I shall not go into particulars in this point, because I consider it derogatory to the character of scientific men in general, but forthwith proceed to notice another apparently insurmountable objection.

“FOURTH OBJECTION TAKEN FROM EXPERIENCES CONTENDING AGAINST THE FOREGOING POSITIONS AND THEIR ILLUSTRATION.

“*Fourth Objection.*—There are some experiments and experiences directly opposite to the positions taken above and inferences from them.

“1. Beside the invalid whose case we have noticed before, there have

been several more men with but one testicle who nevertheless begat children of either sex. See SCHURIG'S 'Spermatologia,' chap. 2, § 14, item chap. 9, § 3.

"2. Experiments have been made by VERHEYEN upon a horse having but one testicle, and which nevertheless begat male and female colts, as has been cited by WOLF in his 'Reflections on the Use of the Human Genitals,' chap. 6, § 186.

"3. The above doctrine is further controverted by some known instances of a protracted gravidity, which may be found in SCHURIG'S 'Syllopsilogia,' sec. 5, chap. 6, § 10.

"I shall comment upon the principal experiences successively, giving to each a place at full length. We shall then see how far they bear the stamp of truth and infallibility upon their face, and whether they are therefore entitled to any consideration.

"First, then, the experiences noted by SCHURIG about men having but one testicle :

"REGNER DE GRAAF dissected, at the hospital at Leyden, a body on which he found but one testicle, without being able to discover a scar in the scrotum or in the abdomen. He asked his wife about it, with whom he had four children whether he ever had two testicles, and she replied that he never had but one, as far as she knew.'

"To this, as little as is proved by it, I have to say, that, in the first place, no mention is made of the sex of those four children, and that therefore the objection must lose its whole weight, as I have never denied the ability of men with but one testicle to generate children. If those children actually were of both sexes, it was a great fault in GRAAF or SCHURIG not to allude to it at all, although it might yet be ascertained by reference to the ecclesiastical records. But even admitting this, it would certainly, however impertinent, have been a more important question to put to the woman whether she never had any intercourse with men who had both their testicles, instead of asking her whether her husband ever had two testicles, although to the former a candid answer could hardly be expected.

"Furthermore, it is not stated whether GRAAF particularly examined the testicle, as both testicles might have grown together; or a man with but one testicle, an instance of which is related by the author at the end of the same paragraph from which the preceding quotation has been made, might have double spermatic vessels in that one.

"GEORGE WOLF WEDEL mentions the case of a student at Meissen, who, having but one testicle, proved his manhood in spite of it by a numerous progeny of both sexes; and SOLOMON BRAUN relates that he knew a farmer, having but one testicle by birth, to have nevertheless

begat a number of children of either sex. Likewise has an instance been related by BALTHASAR TAMAEUS, of a gentleman by the name of MANTEUFEL, who, having been deprived, during his infancy, of one testicle by an operation for a rupture, and having in consequence been rather bashful from an apprehension of impotence, after he had finally got married begat fifteen children of both sexes with three legitimate wives. Another instance of the same kind is mentioned by BENEDICT HERMANN, etc.

“As to the case of the student and the farmer, it is to be recollected that no notice is given whether one testicle was not retained in the abdomen, or whether the one did not contain the vessels usually assigned to and found in both. Of the latter, a case witnessed by himself, is related by PAUL ZACHIAS in his ‘Medical Questions,’ vol. 1, part 3, quest. 7, § 4, p. 242. Therefore there is nothing at all proved by these instances.

“MANTEUFEL has undoubtedly had very accommodating neighbors, and as nobody else has guaranteed the fidelity of his connubial she-devil, I do certainly not feel disposed to do so. Nor is it said whether he had children of both sexes with each of his three wives. So much for the case of MANTEUFEL (man-devil).

“But then I hear the other party say, There are the Hottentots, who always take one testicle from every male child. This would certainly be a decisive blow, if not travelers to those places had ascertained the falsity of this statement. There may be men with but one testicle among that nation, as well as among all others, but the prevalence of that custom is by no means established from credible authority. And what I have just now said against the preceding experiences applies equally well to VERHEYEN’s experiment mentioned at the beginning of this paragraph, for, in short, it follows, from one and all that they are too superficial to counterbalance actual proofs, as adduced by me in support of my positions.

“I shall now turn to the arguments abstracted from cases of protracted gravidity. I shall give them, too, *verbatim*, as recorded by SCHURIG at the before mentioned place.

“Extract of a letter from Stuttgart, in Suabia, dated March 28, 1720 :

“‘Now, I shall report an occurrence here which must be incredible to any body who did not see it himself. There died, a fortnight ago, an old woman at the age of ninety-two, who became pregnant, forty-six years ago, and when the time of confinement was at hand the labors came on her, yet no birth took place, but the pains gradually disappeared. The woman herself has constantly maintained that she bore a child within her, since she did not only feel its motions, but also heard it cry sometimes. At last, as nothing ever passed her, she was laughed at by all

physicians and midwives the more so as she, *ex post facto*, became pregnant twice, giving birth to a son each time, both living and being married at this day. In spite of all this the woman persevered in her statement, that the first child was still in her womb, and in consequence entreated her confessor and other acquaintances to solemnly promise and assure her of causing her to be dissected after her death, to convince the world that there was a child still in her womb which might have grown fast to it. Now, as aforesaid, this woman lived to be ninety-two years of age, having died a fortnight ago, adhering to her statement until death; and on being dissected there was found on the same side of which the woman was constantly complaining, near the horn of the womb, a large, hard, longitudinal ball of the size of a squash, the integuments of which were nearly as thick as the cranium of a calf. This ball, on being cut apart, contained a perfect babe, a boy, dead to be sure, but quite fresh, and of the same shape of new-born children in general, though it had been lying in the womb for forty-six years. After it had been seen by the Regent and the whole court, it was forwarded to the Medical Faculty at Teubingen, by whom, after being preserved, it was returned to be kept in the museum.'

"In the perusal of this account, which if true would refute my position, it is to be considered:

1. "That it was a kind of newspaper intelligence, which usually lacks accuracy as well as good authority, both requisites for accounts of so much importance as this would be if creditable.

2. "Not taking into consideration that the name of the woman is not given, it is not even stated who dissected her, whether a credible, celebrated physician, or a surgeon's assistant, which ought to be known to us, inasmuch as it has occurred in Suabia in 1720, and even at a later period, that dissections were made by very incompetent and disreputable persons.

3. "The ball is said to have been of the size of a squash. This statement is rather suspicious, for being as vague and uncertain as the size of squashes. Any competent person would, for his own sake, have given the dimensions according to a generally known scale.

4. "This strange kind of squash is said to have been located in the Fallopian tube. Where, near the ovary, or in the middle, or where else? Ought not all this to have been expressly stated? I wonder whether the operator knew the Fallopian tubes? The ball had a hard shell and was cut apart, still the foetus was not injured.

5. "A boy has been seen in it quite fresh, and yet it is not said how it was supplied with food. Here I will ask every intelligent physician, whether he would not, if not impossible, at least think it highly im-

probable, whether a foetus can be preserved for forty-six years without nutrition? or whether in any living being, after being deprived of food and the subsequent cessation of circulation and reproduction, the fluids do not become decomposed and a general putrefaction does not take place? Whether there are not numerous instances of foeti, which, having been retained in the Fallopian tubes, were always in a state of decomposition, and had to be taken out? A number of such instances have been mentioned already by very old physicians, and a collection of a great many of them may be found in VALISNIERI'S, in his before-mentioned work. However, I will not absolutely reject even a most improbable possibility, as the incrustation might have prevented decomposition. But it was stated that it had been seen by the Regent and the whole court, upon which I would most respectfully insinuate that it would have told much better if seen by one intelligent physician, than by ten regents with their suites.

“But, to see at once into the character of the whole report, and to form an idea of the authenticity of newspaper intelligence generally, I shall give another version of the same story, as found in SCHURIG immediately below the last quotation made from his work :

“Account of a foetus forty-five years old, taken from a woman ninety-four years of age, and transcribed from Regensburgh, the 11th of April, 1720 :

“The old woman at Leinzell, who has been pregnant for forty-five years, has died a few days ago, and on being dissected by the barber of Heubach, a ball not quite round, resembling pretty much a bowling ball, has been found in her, the shell of it being of a finger's thickness, and, having been cut apart with a hatchet, containing a foetus in its natural position, one hand covering its eye, the other resting on the knee, and being supplied with an umbilical cord like any other foetus. It is a male, but it could not be discovered how nourishment was carried to it, since it must have been alive at the woman's death, being quite fresh even now. Aforesaid shell resembles a cranium, and had grown fast to the womb of its mother. The greatest miracle, however, is that this identical woman subsequently conceived two more children, living at the present day. On the side where the shell had grown fast it is soft, and if the child comes out of it, it will at least measure a foot and a half in length. But as this ball has afterward been forwarded to Teubingen, it will be taken out of its shell at that place.’

“This account differs materially from the first. According to it the woman is ninety-four years old, and has been pregnant forty-five years only. It is stated, also, that she was dissected by the barber of Heubach. And on taking into consideration the scientific qualifications of a village

barber, particularly in 1720, this is a fact not calculated to give any weight to the report. That he was ignorant of anatomy was plain from the description of the shape, and still more so from using a hatchet in cutting the ball apart, instead of sawing it. The globular figure was not grown fast to the Fallopian tube, but to the womb itself, therefore this case could not prove any thing against me. It is further said that the shell had been soft on one side, why then be so stupid as to cut it apart through the hard? Furthermore, it is stated at the end, that the foetus was taken out of the shell at Teubingen, and yet it was predicted that it was a male, and occupied the usual position of children in the womb, and all this, too, in the face of the before-mentioned fact, that the shell had been cut apart with a hatchet, etc.

“SCHURIG, however, seems to attach a great importance to this story, as may be seen in section 11, at the previously quoted place, where he reasons thus :

“ ‘ In how far this report may be relied upon, will best be judged by the reader from a description of the same case as given by JOHN BURCHARD in his “*Ephemerides Academicæ*,” observation 48, page 337, which follows here : I communicate a singular case of the incrustation of the corium and a foetus half a century old, which has been preserved in the womb for forty-six years without being decomposed in the least. On the 11th of March in 1720, died, in the village of Leinzell, belonging to MR. DE LANG, an old Suabian woman by the name of ANNA MILLER, being ninety-four years of age at the time of her death. She has been dissected by two barbers of Haubach, the one being the son-in-law of the other, because she persevered, in spite of all contradictions, in stating that she was carrying for forty-six years a foetus in her womb, of which she had not only felt the motion, but also most painful though fruitless labors for three weeks. She had afterward borne two more children, a boy and a girl, both surviving, the former living at Bischoffsheim, as a huntsman, and the latter having been married to a Frenchman during the late French invasion, now living in France. In the uterus of this woman a round, bony ball was found, weighing eight pounds, and not unlike a large bowling ball, grown fast to the bottom of the womb, by means of a fleshy skin, in which, on being opened by forcè, was discovered a male foetus having flesh, skin, bones, and an umbilical cord, not in the least decomposed, and nearly of the normal size. To the truth of this story do testify JOHN CHRISTOPH DE LANG, a captain of Suabia, owner of the place, and JOHN MICHAEL WEBER, pastor of the same.’

“ To deny all truth to a report authenticated by witnesses whose names have been given, would amount to a denial of the authenticity of all historical knowledge. However, it is strange that in spite of my

inquiries and personal search at Stuttgart, as well as at Teubingen, there is neither in the museum of the former, nor in the medical annals of the latter academy, to be found either the anatomical preparation itself, or any notice of it. Nevertheless, I shall not extend my doubts any further than to the faithfulness of the report on this occurrence. The first statement locates the ball in the Fallopian tube, the two latter in the womb. If, therefore, we prefer two witnesses to one, there is nothing that goes against me in the whole story, since in this case it only proves the difference in the ovaries, and on the other hand is a strong argument in favor of superfœtation. However, I am bound to confess that I do not comprehend how the womb can possibly contain a perfect fœtus beside so large a ball, nor how the fœtus matured afterward could have been developed without any deformation. These very reasons induce SCHURIG to raise some doubts as to the place where the ball was found, and he expresses his regret that the dissection was not made by a skillful anatomist. However, even more inexplicable it is to me that, as before said, no trace nor account whatever on the subject is to be found, neither at Stuttgart nor Teubingen, since there are voluminous notices of, and comments upon, cases of much inferior importance.

“FIFTH OBJECTION, TAKEN FROM THE PROMISCUOUS MALE AND FEMALE FŒTI IN ONE FALLOPIAN TUBE IN ANIMALS BEARING SEVERAL YOUNG ONES AT A TIME, AND ITS ILLUSTRATION.

“*Fifth Objection.*—Young ones of both sexes have been found promiscuously in one Fallopian tube of multifarious animals. See JOHN CHRISTIAN LANG’S ‘Physiology,’ part 1, page 236, quoted also by SCHURIG at the before-mentioned place, section 4. VALISNIERI, in his often mentioned book, somewhere relates a case where on both sides of the womb were found male and female fœti promiscuously. To the first case I beg leave to remark that it is not stated that these promiscuous fœti had been perfected in the Fallopian tube, which can hardly be thought of in animals, as their womb and its contiguous parts are not exposed to so many preternatural compressions and other injurious influences. But if they were mere embryos on the road to the womb, it may very reasonably be doubted whether their sex could have been distinguished. Might not imagination have been active here as in the case of the animalculæ, where a perfectly formed man was fancied to have been seen in the egg while yet attached to the ovary? I am doubtful, too, whether in this sentence ‘cornu’ means the Fallopian tube. In the latter case this experience would contend against my position as little as those of VALISNIERI, for it is not disproved that each sex had taken its own side, nor

that they became mixed up as embryos in the uterus. Besides, my experiences are in direct opposition to those which have, as stated, been made in regard to the Fallopian tubes, and may be followed up much easier than it will be to recognize the sex of the embryos in the Fallopian tubes.

“But why engage in advance in putting down objections, of which I shall not be able to guess at but a small number, and which upon an impartial examination will fall to the ground of themselves? It will be preferable, I think, to leave them, and to briefly state and partly recapitulate my notions on the process of generation, the generation of boys and girls, mulattoes, etc., and subsequently to abstract from that theory the rules for generating boys or girls, as well as to support my views from the preceding experiences not only, but also from such as will be recorded hereinafter.”

THE LATEST THEORIES.—The following articles, which have found their way into the medical journals and newspapers, are the latest speculations which I have seen advanced on this subject. The theory of M. COSTE, the reader will perceive, is merely a modification, if not an entire adaptation of the theory of TIEDMANN, while the “new notion” of DE FERRENDI is a plagiarism on the theory of SIXT :

“PROCREATION OF THE SEXES AT WILL.—At a late meeting of the Academy of Sciences an interesting memoir was presented by M. COSTE. The learned Professor of Embryology at the College de France, who has already produced so many remarkable and well-known works on this important branch of the natural sciences, related a series of experiments which he had been led to undertake by the publication of M. THURY'S (of Geneva) theory on the procreation of the sexes at will. This theory, it will be remembered, is grounded on the idea that the ovum passes through two distinct phases: a first period, which corresponds with a lesser degree of maturation, and during which the sex is female; and a second period, one of more advanced maturation, during which the egg is male; and according as fecundation takes place at the beginning or at the end of maturation the product will be male or female. M. COSTE'S first experiments were made on multiparous animals, chiefly fowls. If we suppose the seminal fluid to be diffused at a given moment on the ovary, and consequently on the ovules which still adhere to it, according to M. THURY'S theory, the first ovule which tears its covering and issues into the oviduct is necessarily the one which bears the highest degree of maturation. As a single coition permits a hen to lay during twenty days

after, it follows that the last ovules which quit the ovary are at the moment of fecundation far less advanced in maturation than the former: these, then, should give male products and the others female. According to M. CESRE this is not the case, and in all his experiments made on hens the first egg was always infertile, while the following were indiscriminately male or female. Fecundation may be supposed to take place in the Fallopian tube, and not in the ovary, the sperm being arrested in the pavilion or at the extremity of the oviduct. But then each egg which comes into contact with the fertilizing liquid having attained the same degree of maturation, all the products should be male, which is not the case. Other experiments were made on rabbits, to which M. THURY'S theory was equally applicable; that is to say, females fecundated when the period of rutting has just commenced should give birth to females, and *vice versa*. Experience has given a contrary result, and a she-rabbit having been fecundated at the very outset of the period of rutting, produced a greater number of males than females. M. COSTE proposes to examine in a future paper the same phenomena among uniparous animals.—*Lancet*, June 3, 1865.”

“THE PRODUCTION OF SEX.—A Mr. DE FERRENDI has advanced, in the *Scientific American*, a new notion about the cause of the difference of sex in animals. He says:

“For several years I have been in possession of this knowledge, and being a Frenchman, I had intended to communicate it to the Academy of Sciences at Paris; but illness has prevented my return to France. Fearing that my secret may perish with me, as in the case of SEGATO, I have decided to publish it for the benefit of all civilized people.

“Experience has shown that the theory heretofore prevailing in regard to the production of the sexes is false, and that this which I submit is the only true one.

“It is the male who engenders the substance destined already to be of the masculine sex or the feminine, before the female receives it. The right side apparatus engenders the male, the left the female. By operating a partial castration, therefore, of the male, it is easy for stock-breeders to procure offspring all of either sex.

“At La Hotte, near Fort Liberty, in Hayti, this process has been in operation for several years, and for the twelve years that I have watched the result it has never failed.’”

“INSURMOUNTABLE” OBJECTIONS CONSIDERED.—Having, in the preceding pages, presented in detail the ample and care-

fully-conducted experiments which seem to demonstrate the truth of the theory of SIXT, it is due to truth and candor that I frankly state that experiments have lately been made the results of which seem, as conclusively, to disprove that theory. How to reconcile the conflicting results of the experiments has been with me a perplexing problem; but after much study I have arrived at a conclusion, which, if not satisfactory to others, will probably soon lead to a series of experiments which will be conclusive, either in establishing the theory of SIXT beyond all question, or else in proving that we stand where we did when the morning stars first sang together—that we know nothing whatever about the law of sex.

Several persons to whom I had given instructions, previous to publishing the "Mysteries of Nature," had each and all been successful in producing offspring of the sex desired. A number of gentlemen, who have at my solicitation, experimented on animals, have confirmed the theory of SIXT. But, on the contrary, two gentlemen of my acquaintance, whose intelligence and integrity are unquestionable, have failed in producing the same results. The following communication which I have lately received from one of the gentlemen referred to, presents, very clearly, the other side of the question before us :

"DR. TRALL—Several years since, but five or six I should think, a book entitled the "Mysteries of Nature" was announced as explaining the physiological law of sex, and furthermore that by following the directions as given in the book, parents and breeders of stock could control the sex of offspring.

"I saw the advertisement of the work above mentioned in the *Water Cure Journal*, and, if my memory serves me right, it received an 'editorial notice' to the effect that the law that governs the transmission of sex was rightfully explained in the book above mentioned. I bought one of the books, but until the past year, have not had an opportunity to fully test the thing to my entire satisfaction.

"In the first experiment, a male sheep was fixed for the purpose, by removing one of the testicles, and at the proper time placed with half a

dozen ewes separate from the rest of the flock of sheep. The result of this experiment was, that part of the progeny was *male* and part *female*. The past year another experiment, to more fully satisfy myself, was made with swine, and with the same result. A male and female that never had any connection with the other sex before were selected. The male was prepared for the experiment by removing the *left testicle*, and in a few days placed with the female in a separate lot. At the proper time the female had fourteen pigs, four of which were male and ten female. Another experiment with two other females and the same male was made. The result was that one had *eight males* and *one female*, and the other *three males* and *four females*.

"In every instance the result was the same, namely, male and female; when if the *experiment* had been fairly tried and the *theory* correct, there should have been only one sex represented. I think there can be no doubt of the experiments being fairly tried, as in each instance the animals were kept by themselves.

"The results were different from what I had expected, as, from the positive statements made in the book, of experiments that had been made, and from reading the book, the theories therein presented seemed quite plausible. Here, those that have read the book and witnessed the experiments pronounce it, and the man that wrote it, a humbug!

"Last evening, in looking over the January number of the *Herald of Health*, 1865, in the Publisher's Department I see that Drs. MILLER, Wood & Co. still advertise for sale the 'Mysteries of Nature, or the Law of Sex Explained.' I thought you would be glad to hear of experiments made to test any theory that attempted to explain the law of sex. To me it is a mystery yet.

"Not having a personal acquaintance with you, I venture to send this after reading your publications and admiring them for the last ten years; because, when you said any thing, I believed you thought it was the truth and was willing that *that* should prevail, whatever should become of fine-spun theories. Hoping that you may have success in the great work undertaken, believe me truly your friend."

The above experiment seems to cover the whole ground of controversy. And it is well to recollect, in this place, that HIPPOCRATES, ARISTOTLE, and many of the ancient philosophers, have vaguely taught that the right male and female organs are appropriated to the male, and the left to the female sex. Nor should we forget that an "act of procreating the sexes at pleasure" was once in vogue based on this theory. But the

theory was discredited and the art fell into disuse mainly because females had borne children of both sexes when one ovary was diseased or had been extirpated, and in one case where an ovary, on a *post-mortem* examination, is said to have been entirely wanting.

Of course we have not the data which would enable us to examine these experiments and these statements as critically as would be necessary to predicate any thing on them more than a fair presumption, and I do not, therefore, propose to admit nor deny their accuracy nor their truthfulness. I propose merely to suggest a hypothesis which will explain the failures without invalidating the correctness of the theory of SIXT.

It should be particularly noticed that in all the experiments which have been tried, sexual connection was had as soon after the removal of one of the reproductive organs as the healing of the wound would permit. Now, although the body of the testicle (and the same remarks will, with a slight modification, apply to the ovary) performs, under normal circumstances, the function of forming or secreting the seminal fluid from the blood, it does not follow that the glands of the seminal vesicles, or even of the mucous surface of the seminal ducts, may not secrete it. It is admitted by physiologists that they do secrete a fluid to be mingled with the semen; and as they are necessarily intimately associated with the testes in position, circulation and sensibility, the supposition is not, I trust, chimerical, that they may under extraordinary circumstances secrete from the blood the elements which constitute the "sperm-cell," and which are capable of impregnating the ovum. It is well known that when a part or organ is removed, and when an artery is ligated, the small arteries of the surrounding part are enlarged by the pressure of blood upon them from the main supplying artery whose current is now arrested. Circulation is thus increased, sensibility is correspondingly augmented and functional power exalted. And when it is considered how exceedingly minute is the

quantity of seminal fluid required for fecundation, and how microscopical in size may be a glandular structure, the possibility of the process we are contemplating becomes a strong probability. To disprove the theory of SIXT, therefore, requires that every vestige of the social organism of one side should be effectually removed, and then the animal found capable of procreating both sexes. I can here anticipate another complication to this method of experimentation. It may be said that reasoning analogically on the premises I have laid down, when one testicle, for example, is removed, with all of its appendages on that side of the body, the other testicle may be exalted in energy so as to produce the "sperm-cells" for both sexes. I can give no reason why this may not be so, and nothing but direct experiment will ever determine it; but I can conceive how much easier it would be for the minute glandular structures which cover the mucous surface of the seminal duct, and which form so large a portion of the seminal vesicle, to secrete a perfect seminal fluid when the testicle has been removed. And this would, it seems to me, be more likely to happen soon after the removal of the testicle than at a later period, for the reason that the habit of a determination of blood to the part during sexual excitement would be greater than at a subsequent period—the absence of the testicle probably causing this determination to decline gradually. Hence, the longer the testicle has been removed before the experiment of copulation is tried, the more valuable will be the testimony as affecting the theories of the law of sex.

I am not aware of any observations on record wherein the male or female parent was entirely and congenitally deficient in the organs of one side. If the offspring of such parents were of both sexes, I should not know how to reconcile the fact with the theory I am advocating.

So far as I have been enabled to make observations for eight or ten years past, they have in every instance confirmed the theory of SIXT. I have known several women who suffered of ovarian disease, and in all such cases all children

born subsequent to the appearance of the malady were of the sex corresponding to the sound organ. I have known, too, several cases of severe dysmenorrhœa, *occurring only each alternate month*, and attended with appreciable pain, heat, distress or tenderness in one groin, with no such symptoms in the other groin; and of all such women who have had children, the sex has been in accordance with the theory advocated in the "Mysteries of Nature."

In the discussion of this subject it is proper to state that I am well aware of the cases reported in some of the medical journals and noticed in some of the works on Physiology, in which females have been dissected in some of the French hospitals in whom no trace of an ovary or Fallopian tube could be found *on one side*, yet they had borne children of both sexes. But when the reader learns, as I have, that the majority of statements, like the majority of theories, that fill medical journals, and even occupy a large space in the standard text-books, are wholly unreliable, he will be slow in forming conclusions from such data.

NOTE.—I had hoped to complete a series of experiments I have had in progress for several years, bearing not only on the problem of sex, but also on that of the regulation of the number of offspring, before giving this work to the public, but engrossing and unavoidable professional duties have thus far been in my way, and may be for an indefinite period in the future. I shall, however, prosecute these inquiries with all possible expedition, and give the results, whatever they may be, in some future edition of this work, or in a monograph on these specialties.

MENSTRUATION ALTERNATE.—Consistently with the theory that each ovary produces, normally, eggs of only one sex, and with the facts that the human female normally produces but one at a birth, and that male and female children are born in nearly equal numbers, it would seem to be the law of menstruation that the monthly evolution of an ovum shall take place alternately from each ovary. As this subject is almost entirely new to the medical profession and to physiologists, it

can hardly be expected that any important data bearing on the subject can be found recorded.

But I have been enabled through a very extensive correspondence, and a large acquaintance with invalid women who have consulted me professionally, to gather some statistics which seem to be conclusive—at least, I know not how otherwise to account for or explain them.

For example: A lady, in consulting me by letter in reference to some obscure form of uterine disease or displacement (her physicians were unable to make a satisfactory diagnosis), writes:

“Every other month menstruation continues two days, and on the alternato months its duration is from four to five days. The two-day periods are painless and natural, but the alternato periods are always attended with pain and a sense of weight or bearing down for about twenty-four hours at the commencement.”

I have several communications making substantially the same statements, and I have had several patients in hand whose periods were perfectly normal every other month, while each alternate menstruation was attended with severe dysmenorrhœa.

I am not able to suggest any theory which will explain these facts except that of alternate menstruation. That the attention of the medical profession has not sooner been directed to this subject is not strange; nor is it to be wondered at that it has never attracted the attention of women themselves. In the great majority of cases diseases of menstruation affect nearly equally both ovaries. In most cases they depend on morbid conditions of all of the reproductive organs, these conditions being dependent on constitutional or general cachexy. Hence it is only in very rare cases that any difference in the symptoms attending the menstruation of alternate periods, whether normal or abnormal, would be noticed or thought of. In the former case there are no symptoms of any kind to complain of, and in the lat-

ter case the pain, distress, heaviness, bearing down, etc., are so diffused through the pelvis, back, abdomen, and even still more distant parts—often also involving the bladder, rectum, and even respiratory muscles, in “sympathetic” or associated irritation—that it is difficult, if not impossible, to localize the seat of disturbance to either ovary or to both.

I have, however (having had my mind for years directed to this point), found several cases in which the patients had long been conscious of pain and distress only in the region of one ovary at the menstrual period, and in nearly all of these cases the patients (on calling their attention to the subject) could very clearly recollect that there had long been a difference in the menstruation, that of each alternate month being more prolonged, more painful or more hemorrhagic, or different in all of these respects.

Again, the fact that the woman normally produces but one at a birth is, at least, strongly presumptive evidence in favor of the doctrine of periodical ovulation alternately from the right and left ovaries. That menstruation, considered physiologically, *is* ovulation and nothing else, may now be regarded as well established as is any problem in physiology. But if ovulation occurs simultaneously from both ovaries, how can the viviparous character of woman be accounted for? No one, I think, will seriously contend that an emission of seminal fluid is only capable of fecundating one ovum, nor will any philosophical mind pretend that the discharge of ova from one or both ovaries, as the case may be, is not determined and governed by *some law inherent in the organism*.

As woman develops the egg, it is certainly more reasonable to suppose that she also develops the sex—in other words, that sex is inherent in the egg—than that it is communicated by the male.

To ascertain the fact whether menstruation occurs alternately from each ovary or simultaneously from both, requires only that the attention of physicians, and especially of “women doctors”—who are now, fortunately for the human race,

becoming an "institution" of the civilized world—be generally directed to its investigation. The observations of a hundred practitioners, accumulated for half a dozen years, could scarcely fail of affording a satisfactory solution of the problem. And I take this opportunity to request all to whose hands this work may find access, to communicate to me the results of their observations and experiences.

But, in order to have the proposed observations of any intrinsic value, menstruation proper must be carefully distinguished from mere uterine hemorrhage. Physicians are continually mistaking a discharge of blood for menstruation, and medical journals very frequently confound uterine physiology and pathology. For example: In the *Philadelphia Medical and Surgical Reporter* for March 18, 1865, a case is reported, concerning which the writer remarks:

"Of her previous history, she stated that a few months before her marriage, seven years ago, she had an abscess in her left side (of the left ovary, I think) which discharged externally. Suppuration of the same organ again took place shortly after marriage, and after the birth of first child. Since the birth of last child, two years ago, she has suffered from this uterine pain, with foetid discharge at each menstrual period and general ill health. She was attended in her last confinement by an ignorant practitioner. She says the placenta was not properly or wholly removed. Menstruation occurred four months after delivery, and has been frequent (about every three weeks or oftener) and profuse since. Menstrual discharge generally accompanied with pus. (Query: Does not the ovarian disease hasten menstruation, leaving a shorter interval, and at the same time cause the periodical congestion to terminate at most of her periods in suppuration?")

Although ovulation does in some instances occur as early as three months, and in some few cases as early as the second month after childbirth, the case above related is clearly *menorrhagia*, and not menstruation at all. Reports of similar cases, in which pathology is mistaken for physiology, are not uncommon in medical journals. But to mistake a hemorrhage occurring once in "three weeks or oftener," especially when accompanied with a purulent discharge, is rather an

uncommon blunder. The author will perhaps see the absurdity of his query when he learns that menstruation is ovulation. Disease of the ovary may indeed hasten inflammation, hemorrhage, suppuration and other evidences of *morbid action*, but how it can hasten the performance of a normal function I am unable to comprehend.

Women not unfrequently find themselves pregnant when no menstrual hemorrhage has occurred since the birth of the last child; and regarding a discharge of blood as the essential part of the process, they are puzzled to account for that condition, as are generally also their physicians, and they are very apt to suspect themselves of having gone, at least in one instance, "contrary to Nature." The following letter is a sample of many I have received on the subject. It is from an intelligent editor in Central New York :

"DR. TRALL—*Dear Sir* : Presuming you to be at all times anxious to obtain knowledge of all facts which have a bearing upon the correctness of a theory you have adopted, and being myself desirous of an explanation, if possible, of a difficulty, I take the liberty of stating a circumstance which otherwise I would not like to mention. Our second child was born fourteen months after the birth of the first. During that fourteen months there had been no menstruation. The first child was healthy, and nursed until it was found (to our surprise) by unmistakable signs that its mother was again pregnant. Now the difficulty is this: In your 'Encyclopædia' you say that 'impregnation can only occur between the commencement of the menstrual excitement and twelve days after its cessation.' To be sure, you introduce the words 'as a general rule,' but I suppose they refer to the duration of the period, rather than to the fact that it can not occur except *after* menstruation. In the case I have mentioned there had been *no menstruation*; so impregnation *did occur* under conditions other than those you state to be necessary, unless I have misapprehended either the facts or your theory."

The misapprehension of our correspondent is in relation to the rationale of menstruation. And here is another to add to the numerous cases in which ovulation occurs unattended with hemorrhage.

The question of twins, triplets, etc., whether of one or of

both sexes, does not affect the discussion of alternate menstruation, for any thing, every thing or nothing can be proved if we take abnormal conditions, "the law of disorder," for our criterion of judgment. The following case is interesting, though it has no direct bearing on the problem before us :

"BLACK AND WHITE AT ONE BIRTH.—Dr. ISAAC SMITH, late Assistant Surgeon of the Twenty-eighth Massachusetts Regiment, while on duty in the Post Hospital, New Iberia, La., met with a very curious case of births which he relates in the *Boston Medical and Surgical Journal*, as detailed below :

"On the morning of the 8th of December, 1863, her room-mate came to me and said LIZZIE was very sick and wanted to see me. I accordingly visited her and found that labor was about to take place, she having gone but seven months. She continued in pain at intervals until evening, when I found it necessary to resort to means to dilate the os, which was very rigid. At about midnight, the rigidity having succumbed to treatment, she was delivered of *twins*, each about twelve inches in length; respiration was established, and they lived about half an hour. The peculiarity in the infants was this: The one was of the finest features, perfectly white, and would have done honor to an American mother; while the other was of the true African build, black as ebony, enormously thick lips, curly hair or wool, and oh, such long heels!

"Perhaps it would be well to state, that each child had its placenta and accompanying envelope.

"It seems to me that this case proves that two pregnancies may occur together, which some, I believe, have doubted.

"ISAAC SMITH, JR., M. D.,

"Late Assistant Surgeon Twenty-sixth Massachusetts."

But perhaps the following *curiosity*, published in the *Philadelphia Ledger*, may afford the key that will solve the problem involved in the case reported by Dr. SMITH :

"CURIOUS FACT.—Recently we published a paragraph from an Alabama paper stating that a slave of Mr. JOHN H. HUNDLEY had three children at a birth, two of whom were black and one white. The fact coming to the knowledge of our scientific townsman, PETER A. BROWNE, Esq., who has been making many interesting researches and investigations into the different characteristics of hair and wool, induced him to address

the owner of the slave, with a view of obtaining a specimen of the pilous covering of the heads of the children. Mr. HUNDLEY politely complied with his wish, and sent him specimens of the father's and mother's hair, of the two black children, and also a specimen of that of the white child. The result of Mr. BROWNE's investigations established the curious fact that the white child is a black Albinos, its pile being just as much wool—the characteristic of the negro—as that of the two black children, who are pure negroes, from a pure negro father and mother. We have here the solution of the phenomenon which has confounded the physieian, and which he has been disposed to explain by the presumption of intercourse with both white and black on the part of the mother. In some instances this presumption may be correct, but the practical benefit of Mr. BROWNE's investigation is, that doubt in such cases may be settled dcterminately by an examination of the pilc."

Perhaps I have already said and quoted enough to show the confusion of theories in which this whole subject is involved; yet in order to give the reader a complete *resume* of the floating opinions on the subject of sex, and to save him the trouble of investigating exploded hypotheses, as well as to guard him against mistaking old superstitions for new doctrines, I will in this place finish the record of all the theories which have been advanced to date.

An intelligent medical gentleman wrote me from North Carolina just before the breaking out of our late civil war :

"DEAR DR. TRALL—Concerning the sex question of which I wrote you some time since, I would now state that so far as my observation extends, all male children are conceived in the new or before the full moon, while females are conceived after full moon, or in the 'old of the moon,' as we term it. I believe it is conceded by philosophers generally that the moon governs the *tides* and other phenomena in Nature, and if so, why not also the sex?"

This is not only going back to ancient astrology, but a little beyond it! I fail to see any analogy between the revolving and undulatory motions of planets revolving on their axes and the construction of the sexual organs of a living being. Philosophers in general, and medical men in particular, have been too prone to refer all perplexing problems in physi-

ology to some imaginary but incomprehensible *moonetary* influence.

A correspondent (S. B.) writes from Napoleon, Ohio :

"I have seen it stated that if the husband lies on his *right* side, and his wife lies on her *left* side, during copulation, the offspring, if conception occurs, will be a *male*; and that if these positions are reversed will be *female*."

This notion, as we have already seen, is as old as is the age of the world since the days of HIPPOCRATES; and if the theory of SIXT be true, there is something, though not enough, in it.

A late agricultural journal has the following :

"SEX OF THE PROGENY IN SWINE.—In an essay on the Reproduction of Domestic Animals, by M. GIRON, furnished for the French work 'Annals of the Natural Sciences,' the writer enters into an explanation of some of the causes that govern the respective numbers of sex, particularly in the swine. He contends that among female animals that receive the male only once, those that receive him first, generally produce more males than females. In proof of this position he adduces, among many other cases, the following instances :

"A boar was admitted to two sows of two years old, of the same strength, and on the same day, and the issue of the same litter; the first produced nine males and one female, the last nine females and one male. A young boar of five months old was admitted to two sows of the same litter as the boar; the one which first received him produced five males and two females; and the other, four hours later, six females and two males.

"If further observation should verify the correctness of this position, and the rule be applicable to other animals as well as swine, an attention to it by breeders of cattle and horses might be of considerable consequence to them. We recommend this hint to the observation of breeders."

A single observation of this kind proves nothing; and a hundred might occur without proving any thing more than a coincidence.

I once had an instructive lesson on the fallacy of deducing laws of Nature from coincidences. In the first year of my professional life, every woman whom I attended in childbirth,

for several months, produced a male child. Though not inclined to be superstitious, I felt strange, because of this uninterrupted succession of boys, and of course I greatly desired to officiate at the birth of a girl. At this time I had never thought seriously of such a thing as a law of sex; but if I had been called upon for a theory, I could have suggested one quite as plausible in principle, and better sustained by "observation and experience" than some I have quoted, viz.: "To have a boy, send for Dr. TRALL; if a girl is wanted, employ the other Doctor." It is an equally curious fact that, at this time, the other physician in the place—my competitor—had nearly all girls to reward his obstetrical skill!

The following paragraph has been going the rounds of medical journals and newspapers:

"THE SEXES.—Some philosopher has discovered that 'there is a natural law of relations between the sexes, which is found to vary at different ages, according to the different dangers to which they are exposed. There are more males than females born by about four per cent.; at twenty years of age this preponderance is entirely lost, and there are more females than males; at forty years, the balance is again the other way, and there are more males than females; at seventy, the sexes are about even, and the ultimate age of the human being is reached without any decided advantage to either sex.' This is one of the most curious of the natural laws, and one of the most interesting. If the number of males and females born was exactly equal, the result would be that before they reached middle age, the female sex would be reduced too low and become inadequate to the purposes which it has to fill. In fact, the number of males born is always greater than the females, by about four per cent. Past the age of forty, the deaths of females are the smallest."

Per contra, it has been asserted, with what truthfulness I know not, that where polygamy prevails, there are more females born than males.

The following article from the *Ohio Farmer* contains some curious speculations and some good logic:

"HEIFER OR BULL CALVES AT PLEASURE.—*Editor Ohio Farmer*: A short paragraph in the *Country Gentleman* of November 6, calls attention to the above subject.

“The *Ohio Farmer* also published an item upon the same topic some months since. In the early part of September last, in making a trip through Kentucky, among the principal breeders, the editor of the *Ohio Farmer* being in company, he made inquiry of several breeders, whether or not they had tried the experiment of having cows served when flush in milk, with a full udder. Two replied that they had, one with a preponderance of heifer calves, and the other, I think, without detecting any definite result from the experiment. The inquiry was afterward made of another breeder (one of the Messrs. WARFIELD, if I mistake not), who replied that he had caused five cows with full udders to go to a bull; these cows afterward produced each a bull calf. Several other cows went to the bull with empty udders, these producing calves of both sexes.

“We did not charge our mind particularly with the statement at the time, being fully satisfied that this Dutch discovery (?) could not in any event work harm, nor be the parent of any good. (If the numbers are not rightly stated, Mr. WARFIELD will please correct.)

“How the condition of the udder could determine the sex of the offspring, the laws of reproduction will fail to explain. All farmers who have spayed cows or heifers, know what the ‘ovaries’ are, it being these that are removed. In these ovaries, there are believed to be situated very small bodies, known as the *ovum*. In the act of impregnation one of these little globules is believed to be detached (and in the case of twins, probably two), and to pass through the Fallopian tubes into the womb.

“Now, one of the ‘mysteries’ of Nature, and one that will probably never be unraveled, is, what determines the *sex* of the progeny? It is altogether probable that this is inherent in the ovum itself, and the fact that some cows always produce heifer calves, and others bull calves, is a very strong proof of the correctness of this opinion.

“It is claimed by many breeders that certain bulls ‘get heifer calves, mostly,’ and *vice versa*. If the determining of the sex lies with the *male*, then of course it does not depend upon the condition of the udder in the *female*. Some cows produce altogether bull calves, and *vice versa*, although bred *each year to a different bull*. The laws of Nature are fixed and *uniform*, and are not thrown out of gear by the ‘screws’ getting loose, as in the case of man’s flimsy inventions.

“If the sex is not determined by the male, then of course it is by the *female* (and this determining power lies, no doubt, in the ovum), the sex being variously distributed, some cows being supplied altogether with those of one sex, others of both.

“That the detachment of *female* ovum from the ovaries, and *their*

propulsion through the Fallopian tubes into the uterus or womb, should be dependent upon the udder being full of milk, or the same of male ovum, when the udder is empty, is simply absurd. If there exists any foundation for such a notion, then we should expect that all heifers, and animals of every kind, would produce their *first* offspring of the *male sex*. There is nothing lost, however, and much to be gained in making experiments, provided those of too expensive a nature are not selected. The one in question will be found among those that cost little, and yield less.

“For wise purposes, the allotment of the sexes is placed beyond man’s control. The process that would enable him, in advance, to order the sex of the young at will, in the cattle kind, would at the same time furnish him a key to govern the distribution of the sexes in all animal kind, not excepting his own species.

“G. SPRAGUE.

“STATE AGRICULTURAL ROOMS,

“COLUMBUS, *November 10, 1856.*”

I can see no wisdom in placing “the allotment of the sexes beyond man’s control.” A thousand things useful to be known were “placed beyond man’s control” until he ascertained the law by which they are governed; indeed, all knowledge and all art are, in the same sense, beyond his control.

The following from a correspondent, residing in a Southern State, has a special interest in confirming a theory heretofore mentioned in reference to the cow :

“I saw, a short time since, something that was a curiosity to me—a couple of cows in a yoke. They were large and entirely masculine in appearance—large heads and horns like oxen. Their udders were not developed at all. In fact, a person must stoop in order to see any thing of the milk-bag. I supposed at once these were spayed cattle, though I had never seen a spayed cow. The honest farmer said No; that they were twins, not to each other, but of different parents; and in each case of the twins there was a male and female. The owner says some of his neighbors tell him that in all cases of twins, where they consist one of each sex, the heifers are unproductive. I do not know how it is in regard to the bulls, whether they were correspondingly effeminate, thus mutually blending the characteristics of the sexes as it were. But, sir, if you know this to be a fact, I would like to know if it operates in any

degree in cases of twins among the *genus homo*; for I am thinking I have an explanation for something that has puzzled me considerably. I have been most furiously loving a beautiful girl who possesses all the feminine delicateness of woman. (She is not a 'Tom Boy.')

But, notwithstanding all the demonstrations of the fire that burn within me, she remains cold and passionless, though she says she likes me. You know about these things. What is your opinion?

"P. S.—The girl has a twin brother. I understand also that these cows have ranged in a pasture with a bull three or four years and have never had calves, nor at any time shown sexual inclinations."

Not less interesting than a majority of these communications, and not more chimerical than a thousand things we find in medical books, is the following from Georgia:

"DR. TRALL—*Dear Sir*: Your favor of the 8th instant inclosing a circular—for which I return thanks—and reply to my letter of the 1st instant, came to hand this day, and I hasten to reply.

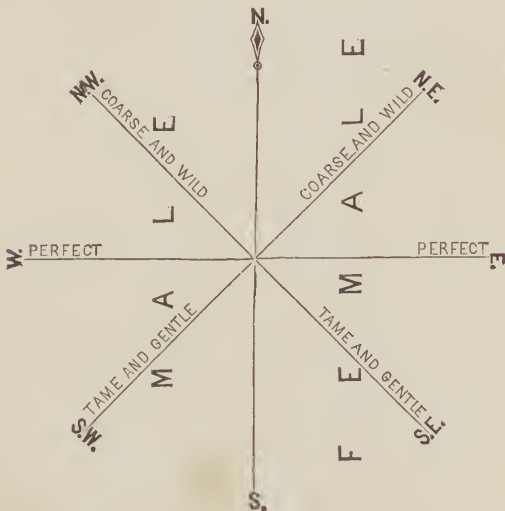
"I am very glad to learn that you think that you have discovered the law that determines the sexes, as I think it much more likely that you, who have been investigating upon well-known and established physiological principles, have discovered that law, than one who is entirely ignorant of physiology, and who claims to have discovered it through mere accident. Nature's laws, however, are always simple, comprehensible, and adapted to the humblest capacity; and it may have been because of its exceeding simplicity that it has never been discovered before.

"I have had another conversation with the old gentleman since I wrote to you; and I have no doubt that he is thoroughly convinced of the truth of his observations. He says he will wager every thing he owns in the world upon a single trial of his theory.

"But here is the secret; you can judge for yourself. He says it is a fact, that if the body, and more particularly the brain, of any animal during the instant of procreation be exactly on a line with the north and south poles, in ninety-nine cases in every hundred conception *will not* take place, but if it should, that the offspring will be deformed and very probably a hermaphrodite. And if the body and brain of the female be exactly east and west, with the head lying directly west, the progeny will be male; partaking equally of the characters and bodily configurations of both parents, but in a higher degree or more improved form, or, in other words, the progeny will be more perfect, bodily and mentally, than the parents, provided they are in sound health.

“But if the body of the mother, or even the head, be turned to either side, say for instance a northwest direction, the character of the progeny will be spirited, wild and unruly, and will partake more of the character, and in features more closely resemble, the father; but if the body and brain of the mother be in a southwest direction, the offspring will resemble the mother, and will be tame, gentle and quiet.

“Now, if the body, etc., of the mother is on a direct line east and west, and the head lying east, the offspring will be of the female sex, and will be an improvement on the characters and the bodily organizations of both parents. If lying in a northeast direction, the offspring will resemble the father; and if in a southeast direction, more generally the mother. I have drawn off a diagram, by referring to which you can more fully understand it.



“This is the whole secret. I shall make no comments on it, further than to say that it really seems to me to be plausible, but I am not well enough acquainted with physiology and magnetism to account for it on physiological principles, if it be a fact; but I suppose you will be able to decide immediately whether it be true or false. I await your answer with impatienee.”

With the diagram the text must be sufficiently explicit, and

I will conclude this chapter of curiosities, or budget of blunders, with the following paragraph clipped from a newspaper of a late date, which is submitted to the reader without comment :

“TO SELECT EGGS CONTAINING MALE OR FEMALE CHICKENS.—If female birds are required, select the roundest and plumpest-shaped eggs, but if males, the longest and most pointed. Another : by the position of the air-cell at the butt of the egg, those may be selected that will produce the male sex ; in these, the air-cell is in the centre of the end. If the cell be a little on one side of the egg, it will produce a female chicken. The position of the air-cell is easily discovered by holding the egg between the eye and the light.”

APPLICATION OF THE LAW OF SEX.—According to the theory of SIXT, it is only necessary that the right or left testicle be firmly compressed or drawn up toward the abdomen, in the act of seminal emission, to beget a boy or a girl. It is always the case that, during coition, one or the other is drawn up so as to compress the spermatic vesicles ; and, although the co-equal compression of the spermatic vessels of both sides from a drawing up of both testicles may be admitted as a possibility, yet there are many facts which seem to prove that emission is, ordinarily and normally, only from one side at one coition. SIXT gives certain rules as to bodily position in the act of sexual intercourse calculated to favor the compression of the organs of one or the other side as may be desired, and, although they would doubtless be sufficient with some persons, I do not deem them to be generally reliable, and therefore do not repeat them. It is true, doubtless, that in a well-balanced system, and with the whole muscular tissue firm and vigorous, a very little change in position might occasion the drawing up of either testicle ; for example, the husband lying on the right side of his wife, and, during intercourse, bending the upper part of his body toward the left, would, to some extent, and no doubt in some cases to a sufficient extent, strain the muscles of the right side so as to insure the compression and consequent seminal emission from the right organ, and *vice versa*.

A clergyman who formerly resided in the city of New York, whom I met at the National Temperance Convention at Saratoga Springs, in August, 1865, informed me that while remaining in the city he always slept on the right side of his wife ; but after removing to the country, the bed was so placed that he took the left side. During his residence in New York his wife presented him with three sons ; and during his residence in the country, his wife presented him with three daughters.

Such statistics, however, may properly be regarded as more curious than useful ; and, although I thought enough of the experience of this clergyman—who, by the way, is a rigid Hygienist and a model of “muscular Christianity”—to remember it, I should not have thought it worth while to introduce it in this place, were it not for the fact that SIXT, in his “Mysteries of Nature” relates a number of similar experiences.

But I think a majority of persons can not rely on this easy manner of proceeding. The only sure method of securing the desired result is to take notice (not a very difficult matter), during coition, of the state of the testicles, and, if need be, press the right or left one, as the male or female progeny may be desired, up against the abdomen ; and especially should this be attended to just preceding the orgasm or emission. Should the wrong testicle become drawn up, it can be pushed down and the other one elevated without difficulty, in which position they will usually remain.

Of course this practice must be continued, whenever sexual intercourse is indulged, until pregnancy is known to exist ; for, as SIXT well observes, “If they were to cohabit both ways promiscuously, it would be better to observe no rules at all, and leave it to chance, inasmuch as it is not to be ascertained which out of many coitions has been the fertile one.”

With regard to certain objections, physiological and moral, which have been raised against determining the sex or offspring by volition, SIXT observes :

“SOME OBJECTIONS WHICH MIGHT BE RAISED TO MY STATEMENTS,
AND THEIR REFUTATION.

“I am confident that I, as well as any body else who had the good or bad luck to make a discovery, or establish a new doctrine, will meet with opponents who will raise objections, therefore I will notice some that might, with some appearance of plausibility, be made, and at the same time endeavor to put them down, thus anticipating the hostile movements of unkind critics and envious colleagues.

“*First Objection.*—It is impossible to observe the given rules at a time when body and soul are under the control of passion, and the quickened circulation takes away all reflection. To this I have to say that I did not write for those who, on account of their age or temper, give way to a mere gratification of sensuality during coition, but my experiences were committed to writing with a view of furthering the cause of medical and physiological science, through a close observation of Nature in her most secret recesses. On the other hand, my directions will be of material use to discreet married people, and especially to those who have an interest at stake in the generation of one or the other sex.

“*Second Objection.*—But how are persons with three or four testicles to do, to generate boys or girls?

“People of this kind are extremely scarce, and no rules can be laid down for exceptions in cases where Nature herself has made an exception to her own rules; nevertheless, an intelligent man will be enabled to find out those rules from perceiving, upon observation, which testicle becomes drawn up toward the abdomen, providing that coition proves fertile.

“*Third Objection.*—Others, again, will say that the laws of Nature are not subject in their operation to the will of man, and that therefore there can be no optional generation.

“This objection is, on the whole, rather insignificant; still, as it is a very common one, I shall say something about it, although I do not expect it would be raised by any physician.

“Is not Nature controlled by man in a great many different ways, although we must admit that she has got to be passive? Have we not almost daily experiences in proof of it from the vegetable kingdom? I shall only mention the engrafting of trees, as well as from the animal kingdom in the generation of mules, etc. Have not the different animals, if it so pleases man, to lose all peculiarities of their species, and to do things for which they were never destined by Nature? Well, but this does not apply to man, the lord of creation. Now, I should like to know where on earth there is a being that has to submit to compulsion more

than man, and yet his physical economy is so vastly different from that of most animals. And does he not force Nature himself by the various degenerations of the sexual disposition, as for instance, self-pollution, etc.? Is he not in regard to the gratification of voluptuousness, frequently more bestial than the very brute? Monstrous vanity to contend that man could not, by reasonable means, influence the laws of Nature in their operation, though there is an undeniable analogy between himself, taken in his primitive state or at the top of civilization, and the animal creation.

“However, there is no talking of compulsion; it is only an advantage taken of Nature, for what else is the object of surgical operations, amputations, etc.? But enough about this. I shall only mention another point that might be considered a material one, and which is the last I can think of.

“*Fourth Objection.*—It would be subversive of the existing order of things, according to the immediate disposition of Providence, to generate boys or girls at option, inasmuch as according to observations taken, the number of boys and girls is, on the whole, nearly equal. The Supreme Being will never tolerate any such encroachments upon His omnipotence, and would therefore never permit men to acquire such sinful knowledge.”

“This objection, which is most likely to come from moralists and religious people, notwithstanding the respect I entertain for their doctrines and sentiments generally, I consider of no more weight than the foregoing ones. For I would ask the most profound moral philosopher, or the most learned divine, whether we do not see too many precedents established in creation, to insist any longer that it would be an encroachment upon the omnipotent Divinity to be in possession of the means of an optional generation? Are the numerous religious creeds, and the still more numerous Pagan notions, some of which sanction murder, incest, and other acts of infamy, anything else but a subverted order of things? or would any divine or religious philosopher undertake to say that they were preordained by and perpetrated under the sanction of Divinity? How does the luxury, prodigality, and dissipation of modern times, in consequence of which so many illegitimate children are born, differ from a subverted order of things? or how the laws of different countries forbidding matrimony if the parties want a certain amount of capital, fixed by law, although the propagation of the race was certainly the main object of the Creator? If it should be said that not all those compelled by circumstances to remain single were lost to propagation, I might ask how this would agree with the commands of religion and morality, and whether it would not be subversive of them?

“Finally, I believe that my discovery, such as it is, will certainly not

subvert the existing order of things, or the laws of Nature; as for the propagation of our race, we have principally to depend on the middle or lower classes, to whom it is mostly immaterial of what sex their offspring may happen to be.

“Again, among those who will peruse my book, there will be many who will be prevented from availing themselves of the information conveyed in it, by their temper or want of perseverance and interest in the subject; but for those classes of society to which my discovery may prove most useful, it might even have been directly intended by Providence, because nowadays we see rather too many daughters of noble families remain in a state of single-blessedness, leading a life of misery, and spending their days without fulfilling one of the principal purposes for which they were created. I will only add, that it appears to me all for the better, that neither the universe, nor even the little globe, which we inhabit, is ruled by the dictates of moral or religious philosophy.”

CHAPTER XII.

REGULATION OF THE NUMBER OF OFFSPRING.

“WOMAN’S RIGHTS.”—No truth is to my mind more self-evident, no rule of right more plain, no law of Nature more demonstrable, than the right of a woman to her own person. Nor can this right be alienated by marriage. “Life, liberty, and the pursuit of happiness,” and also health—without which life and liberty are of little account, and the pursuit of happiness impossible—are God-given prerogatives, and inhere in the person, male or female; and all statutes, ceremonies, creeds, institutions or usages, which in any respect contravene the fundamental law of absolute personal freedom, in all the relations of life, are in derogation of the laws of Nature, and in opposition to the best good of the human family. The great want of the age, of humanity—the great need of man as well as of woman—is, the recognition of woman’s equality. Would it not excite the just indignation of a *man* to be told by any person, even though that person were his “lawful-wedded” wife, that he must beget children when he did not desire them? or that he must perform the act of sexual intercourse when he did not feel inclined to? Certainly, he would never submit to such dictation, such tyranny, nor should he. And why should woman? It ought to be understood by all men and women that the sexual embrace, when either party is averse to it—when both parties are not inclined to it—is an outrage. It is a lustful, not a love indulgence. And whether the consequences are sexual diseases of one or both parties, or personal alienation, or depraved offspring, or all, there is no possible escape from the penalties.

A more pernicious doctrine was never taught than that of absolution from the penalties of our misdeeds. Causes and consequences are as unalterably related in the organic as in the inorganic world. Nature punishes always, and pardons never, when her laws are violated, or rather disregarded. In the vital domain, as in the moral, "no good deed is ever lost;" nor can any wrong act be performed without an evil result. When this great primary truth is recognized practically; when it is taught in our schools and exemplified in our lives, we shall have the true basis on which to prosecute our physiological redemption. "Cease to do evil;" is the first and greatest lesson to be learned. This is emphatically true as applied to the sexual relations, for the reason that the organic laws are more disregarded in these relations than in any other, perhaps than in all other respects. And this disobedience, with its train of untold miseries and its wide-spread sensuality and degradation, is, like most other evils of an earthly existence, attributable mainly to ignorance; and people are ignorant on this subject simply because they have not studied it at all, or have studied it from the wrong stand-points. Woman's equality in all the relations of life implies her absolute supremacy in the sexual relation. It is for her to nourish and sustain the new being; it is her health and life that are directly imperiled by being compelled to bear children when she is unfitted and unwilling for the sacred office; it is her happiness that is more especially destroyed when forced to bring into the world sickly and deformed children, who can be nothing but a torment to themselves, of no use to the world, and nothing but a grief and a shame to their parents. For these reasons it is her absolute and indefeasible right to determine when she will, and when she will not, be exposed to pregnancy.

In the sensuous world around us, habit and fashion rule in the matter of sexual intercourse as much as they do in the matter of eating, or drinking, or dressing. The fashionable world recognizes no rule or principle of dress except

“the latest fashion.” The why or wherefore is never thought of, and in dietetic habits the masses of people follow no law except that of perverted appetency. They eat and drink to gratify alimentiveness, regardless of all physiological considerations and without knowing or thinking whether their appetites are normal or morbid, or whether the viands are wholesome or otherwise.

And as no propensity is more abused and abnormal, as the world is now constituted, than that of amativeness, and as sexual intercourse has become in married life, to a very great extent, a mere habit, to be indulged whenever the *man* feels the inclination, it follows that woman must be degraded to a mere machine in all that pertains to her highest interest and holiest aspirations.

In the animal kingdom the female does exercise her supremacy in this respect. No male animal offers violence to the female. But when she is in proper condition for his embrace, and desires it, she solicits it, and he invariably responds. So it should be, so it is in the order of Nature with man and woman. And when her supremacy is fully recognized, there will soon be an end of stillbirths, and of frail and malformed offspring who can seldom be reared to adult age, or, if they can, are only curses to themselves and to the world.

It may be objected, that to leave this great and important question of having children entirely with woman would endanger the extinction of the race. But such an objection implies little knowledge of woman and less of Nature. The desire for offspring, with all women who are in normal conditions, is the strongest of her nature. It is all-absorbing, all-controlling. It is only in diseased conditions that the pains and perils of childbirth and the cares of maternity are dreaded. It is well understood by physicians that the health of a majority of women in civilized society is seriously impaired and their lives greatly abbreviated by too frequent pregnancies. Thousands are brought to their graves in five, ten or fifteen years after marriage, and rendered miserable

while they do live, for this reason. And so general has this conviction become, that women all over the civilized world, and in all classes of society, are more and more resorting to numerous expedients, more or less injurious, to prevent pregnancy or produce abortion. Nor does it avail for the moralist to declaim against the practice as wicked. All laws are equally sacred in the sight of the Lawgiver, and woman's instincts can recognize no higher law (whatever she may assent to intellectually) than that of self-preservation, and no duty greater than that of bringing into the world children of sound and vigorous constitutions, or none at all.

Restore woman to health, and give her what God has ordained as her birthright—the control of her own person—and the trade of the abortionist will soon cease; but until then not only will the abortionist flourish, but the larger race of empirics in every city, who sell useless or injurious specifics for the prevention of pregnancy, will drive a profitable trade.

THE SCIENCE OF PROPAGATION.—Certain modern writers have suggested the idea that, as the propagation of human beings, like that of animals, is governed by laws which can be understood and influenced by conditions within human control, the subject ought to be studied as an "exact science" and its principles applied as a "true art." Why not? This subject has been studied as a science and practised as an art for centuries—in fact, more or less in all ages—as applied to domestic animals and plants; indeed, as applied to all living things with which man has to deal with the single exception of his own offspring.

What intelligent farmer would be willing to have his cattle begotten, born and bred under circumstances as unphysiological as are his children? The art of raising domestic animals—horses, cattle, sheep and even swine—has attained a great degree of perfection. And the success which has attended this art is due to the recognition of certain principles in physiology which constitute the theory of the science.

The laws of life, the conditions of health, and the rules for normal development are precisely the same in all living organisms. And certainly it is of as much more importance that they should be recognized and applied, in relation to the propagation of human beings, as human beings are more important than animals.

But it happens, unfortunately, that while the whole subject is most assiduously investigated in relation to the animal kingdom, and to a great extent the vegetable kingdom also, it is almost entirely ignored in its application to human beings. The subject is not even alluded to in our text-books on Physiology; it is not taught in medical schools; it has no place in the current medical literature of the world; it is scarcely ever mentioned in the family circle; the good minister never hints at it, and, with the exception of a few of the more progressive of the Health Reformers, nobody tries to disturb the unthinking tranquillity of the public mind. Yet it lies at the foundation of all human improvement and all enduring progress, and is intrinsically the most important problem that can occupy the human mind.

PREVENTION OF PREGNANCY.—Assuming that woman is not morally nor physiologically bound to bear children unless she is fitted for that office, both by normal bodily condition and mental inclination, the question how she can help herself becomes important. Many women will not, and some can not, have the control of themselves in this matter. And the number of married women is by no means inconsiderable, who, because of malformation, constitutional frailty, or local disease, can not become pregnant without endangering their lives; while some are so contaminated with scrofula, so disorganized by the effects of drug medicines, or so devitalized by tight lacing, sedentary habits and constipating food, that they ought not to become mothers. Abstinence is, indeed, infallible; but this is not always possible, nor is it always proper. If sexual intercourse is intended as a love act, inde-

pendent of reproduction, instead of a mere generative act, as is the case with animals (a subject I shall consider hereafter), then it becomes expedient and proper, in all cases where married women do not desire children, and in all cases where they are not fitted bodily and mentally to nourish and train them properly, as well as in all cases where extreme poverty deprives them of the means of either mental or physical culture, to prevent pregnancy without interdicting sexual intercourse.

It is true that if sexual intercourse is limited to about one-half of each month, pregnancy will seldom occur. But this rule is not infallible, for the reason that sexual diseases and weaknesses are so prevalent. The rule which I published in the *Hydropathic Encyclopædia*, fifteen years ago, has been relied on by thousands of married persons, with very few failures. The theory there advanced is, that the ovum usually passes off in a few days after the cessation of the menstrual flow, and that if intercourse is abstained from until ten or twelve days after the cessation of the menstrual flow, pregnancy will not occur. This is doubtless true in the great majority of cases; and I am inclined to think that it is true in all cases where the sexual organism is in a healthy condition. All of the failures which I have known (and on this subject my correspondence has been very extensive) occurred in those who had suffered of leucorrhœa, displacement, constitutional plethora, or torpor of the uterine system. In those cases the process of ovulation would be slower, and the female liable to impregnation for a longer period after the catamenial discharge had subsided. In one case wherein I had an opportunity to investigate the patient's condition and history, pregnancy occurred sixteen days after the cessation of the monthly discharge. She had long been the subject of uterine disease, the uterine system was exceedingly weak and torpid, and so feeble was the muscular tissue that it required nearly the whole month for the egg to be transported from the ovary to the external world.

HOW THE WOMAN CAN ASCERTAIN HER LIABILITY TO PREGNANCY.—A majority of women (and all who are not and have not been the subjects of uterine disease) can easily ascertain by a little attention, which will occasion them no trouble whatever, when their liability to pregnancy terminates, during each monthly ovulation.

When the egg passes the os uteri there is, in most cases, a sense of weight, stricture or bearing down, followed by instant relief. The egg is propelled from its ovarian bed through the Fallopian tube and uterus by a regular peristaltic contraction, of which the woman is wholly unconscious. But, as it passes the sphincter muscles at the mouth of the womb the resistance is greater, and the sensibility of the outlet is greater, than that of any part of the utero-Fallopian channel. It is true that women who have had leucorrhœa, or who have suffered much of any form of menses, have less sensibility of the part and exert a less vigorous contractile effort, while the egg meets less obstruction at the os uteri, so that in such cases the bearing-down effort might not be noticed. Nor would it always be noticed by women in perfect health, unless their attention were called to it. But many women, probably a great majority, by watching themselves for a few days after the cessation of the menstrual flow, can determine the exact moment when the egg passes off, and from that time until the commencement of the next menstrual period they will not be liable to impregnation.

But suppose she can not in this manner ascertain the important fact. She can in almost all cases—possibly in all cases, except when the egg is so disorganized that impregnation would be impossible—by watching the cloth (which should be continued for this purpose) for a few days, discover a clot, something like partially concreted mucus tinged with a drop of blood, which is the egg in a more or less advanced stage of decay. By noticing the time for two or three successive periods at which the egg or clot passes off, she will ascertain her menstrual habit; and as this rarely varies more

than a day or two (except from protracted disease, in which case she should repeat her observations), she will have an infallible guide.

From the statistics of several hundreds of cases which I have gathered and tabulated, the results are as follows: In nearly one-fourth of all the cases, the egg passed into the vagina on the fifth, sixth and seventh days after the cessation of the flux, the greatest number passing on the sixth day. The days next in the order of frequency were the eighth, fourth, ninth, third and tenth. None passed before the third day, and less than half a dozen after the twelfth. Not one passed after the fourteenth.

These observations are quite irreconcilable with many of the doctrines taught by our standard physiologists. A majority of physiologists seem still inclined to the opinion that conception may occur at any time, although they acknowledge that, during the menstrual excitement, and for a few days preceding and succeeding the menstrual flow, it is more liable to occur. But this subject involves a further consideration of the problem briefly treated in a preceding chapter, *viz.*, Where does conception occur normally?

UTERINE IMPREGNATION.—Notwithstanding the formidable array of objections and experiments collated in the chapter just referred to, I am of the opinion that, normally, conception, and even impregnation, takes place in the uterus. The prevalent doctrine is, as we have seen, that the semen traverses the uterine canal, passes along the Fallopian tube to the ovary, and there impregnates the ripened ovum, which, because of impregnation, is arrested in the uterine cavity and there developed. But there are many facts utterly irreconcilable with this theory, and among them are the various methods successfully resorted to for the prevention of pregnancy.

It is well known that, very soon after impregnation, or even conception, any sudden and violent motions which agitate

the pelvic viscera and cause the uterus to contract vigorously, will prevent pregnancy. Drastic purgatives will have the same effect, and are occasionally employed to produce abortion; sometimes violent coughing or sneezing will have the same effect. Running, jumping, lifting and dancing are often resorted to successfully, immediately after connection. Vaginal injections of cold water, or quite warm water, employed within a minute or two after coition, prevent pregnancy in a majority of cases. Many tons of drugs—bicarbonate of soda, and other alkaline preparations—are annually sold at exorbitant prices for the prevention of pregnancy. They are injected into the vagina on the supposition that they destroy the vitality of the semen, or the life of the spermatozoids or animalcules.

But what is the rationale? How do these various processes and agents prevent conception? Though none of them can be relied on as infallible, no one will dispute that they sometimes occasion the effect pretended.

If impregnation occurred in the ovary, I can not see how it is possible for these things to have any appreciable effect. And as it requires several days for the ovum to pass from the ovary to the uterus (two weeks or more, according to the authorities), the preventive measures, to be most effectual, should not be employed until the ovum arrives in the cavity of the uterus, for until then it is impossible for the uterus to expel it. But all observation, experience and authority, concur in the conclusion that all preventive measures, whether motions, shocks, drugs or injections, are most efficacious when employed immediately after sexual intercourse. "The sooner the surer," is a maxim very generally understood.

Now, on the theory that impregnation occurs in the uterus, all of these facts are easily explained. And here let me repeat the distinction between impregnation and conception. Impregnation is the meeting and commingling of the sperm-cell and the germ-cell—the male semen and the female ovum. Conception is the attachment of the impregnated ovum to the

place wherein it is to be developed until the period of birth. All agree that the uterus is the proper place for such development. And as an egg passes into the uterus every month, whether sexual commerce is had or not, why should it not there meet and mingle with the spermatozoa? This would seem to be a very simple, I had almost said *natural* arrangement. Why should the sperm-cell, so long as its *mate* is sure to be in the uterine cavity in a short space of time, be sent on a dubious and difficult voyage to the ovary? All that is necessary for impregnation, as we have seen, is the contact of the sperm and germ. And as the ovum will be several days in the uterine cavity, in normal menstruation, it seems the most convenient and *natural* thing in the world for impregnation to occur there.

On the theory that the egg is in the uterine cavity at the moment of impregnation, it is easy to understand the effects of preventives. Whatever excites *motion* in the uterus causes it to expel its contents. If an egg is present, and is impregnated, it must adhere or become fixed to the uterine wall or it can not develop—there is no conception. But if from any cause the uterus, immediately after impregnation, is so disturbed as to cause it to contract vigorously, it will expel the egg notwithstanding the impregnation. This is why coughing, sneezing, jumping, lifting, injections, etc., prevent pregnancy; not because they expel the semen, as some have supposed; nor because they destroy its life, as others have imagined; but because they occasion the uterus to contract, and if its contractions are sufficiently vigorous and prolonged the egg is surely expelled. Of course the more powerful the exertions, or the larger the doses, or the colder or hotter the injections, the more certain the effect.

It is probable that adhesion or fixation occurs very soon—in a few minutes after impregnation. No sooner are the sperm and germ elements blended by commixture than the process of adhesion commences; and unless uterine contractions be excited immediately, the attachment may become so

firm as to resist all ordinary measures for detaching it. The introduction then of the uterine probe, giving it two or three turns so as to break up whatever adhesions have occurred, will insure its expulsion within a few days.

Some women have that flexibility and vigor of the whole muscular system that they can, by an effort of will, prevent conception! They can, by a voluntary bearing-down effort, so compress the abdominal muscles upon the pelvic viscera as to cause the uterus to contract with a degree of force that expels the impregnated egg, or at least causes it to be moved from the point where impregnation occurred, and where adhesion would soon have occurred.

This is, in effect, precisely the same as are the abdominal manipulations which have been successfully practised both to prevent conception and to cause abortion. And precisely the same effect results from the administration of many acrid and narcotic drugs—cayenne pepper, savin, ergot, cotton seed, quinine, etc.

Women in various parts of the world, and without the benefit of physicians or the aid of physiologists, have discovered methods of causing the uterus to expel its contents at any period of gestation, by compressing and squeezing the uterus by hand manipulations applied to the abdomen. The operation is usually quite painful, but the result is certain. And the same process immediately after impregnation would tend to prevent conception by moving the egg along so that it could not adhere.

I have read a statement in some medical journal to the effect that the women of Iceland seldom had more than two or three children, and the reason assigned was the fact that, after having children enough, and finding themselves pregnant, they would subject themselves to such an abdominal kneading and squeezing as would result in abortion. And a few years ago the *Boston Medical and Surgical Journal* published a statement, apparently well authenticated, that the women of the Friendly Islands, in the Pacific, were very expert in

this method of relieving themselves or their neighbors from the prospective burden of unwelcome children. Some practitioners among them had acquired great skill in this method of "movement cure," and could "carry their patients through" with invariable punctuality in about three days.

The fact that the Jewish women are required by their religious creed to abstain from sexual intercourse for eight days after menstruation, is sometimes brought forward as an overwhelming objection to the doctrine that impregnation takes place normally in the uterus, as well as to the theory that women are most liable to conception soon after the menstrual flow has ceased. But in reply to this it may be remarked that good Jews, like good Christians, are not always scrupulously exact, in the literal sense, in conforming to religious ordinances, when these ordinances apply to "the lusts of the flesh." The law, as given by MOSES, was predicated on the idea that menstruation is a purifying process, and that for a certain number of days thereafter the woman was unclean. Although as a practical physiologist MOSES was far in advance of the physicians of the present day, yet modern science has abundantly demonstrated that menstruation is in no sense a depurating process. The restraint, however, that MOSES imposed on the Jews in this respect was no doubt eminently salutary, considering their depraved and sensuous habits and inclinations, as were all of his regulations and ordinances concerning their personal habits. If we had one MOSES in New York, he would do more to rid the city of contagion and pestilence than all the doctors are doing!

EXCEPTIONAL CASES.—The information given in this chapter will enable nine-tenths of all the women to whom the subject is important to know their own condition, whether liable to pregnancy or not, and to employ such means as may be most convenient under the circumstances when compelled to expose herself. There will be some exceptional cases, dependent on constitutional peculiarities or local derange-

ment, to whom no general rules will apply. And I can only advise such by professional correspondence on learning their condition and peculiarities. But as this volume may fall into the hands of those who have no means or no time for such correspondence, and whose lives are hazarded continually, it may be proper to suggest that any mechanical obstruction placed against the os uteri which will prevent the seminal fluid from coming in contact with the ovum, will be an infallible preventive. A medical friend of mine labored for a year or two on an invention for plugging the os uteri, and although it answered admirably in some cases, it was not adapted to all without a degree of trouble and inconvenience fatal to its general introduction. A piece of soft spongo introduced as high up the vaginal canal as possible may prove efficacious. The empirics of most of our large cities sell extensively articles made of cacutchouc or other soft and elastic material. They are introduced against the os uteri and worn during sexual intercourse, and when they keep their position so as completely to cover the os uteri they are a sure preventive. But they are liable to become so far displaced as to expose the os uteri, thereby rendering contact possible between the semen and ovum. These suggestions, however, may enable the ingenious woman to adopt some device on emergencies that will accomplish the object.

Let it be distinctly understood that I do not approve any method for preventing pregnancy except that of abstinence, nor any means for producing abortion, on the ground that it is or can be in any sense physiological. It is only the least of two evils. When people will live physiologically, as will be seen in the succeeding chapter, there will be no need of preventive measures, nor will there then be any need for works of this kind.

Several thousands of women in the United States have written me the sad—sometimes terrible—story of their sufferings and blasted hopes, some of which have caused the tears to flow, when some of my confidential friends and co-laborers

have read them, because they were compelled to bear children which could not possibly be reared, and which were a constant drain upon their life-forces. They have implored me for a remedy, and so long as the present ignorance prevails, or the present false habits of society exist, so long will there be a demand for relief in this direction. And if these sufferers can not find the desired remedy in the knowledge imparted by this work, they will seek it in more desperate and more dangerous measures. Who can blame them?

CHAPTER XIII.

THEORY OF POPULATION.

THE MALTHUSIAN DOCTRINE.—Nothing is more common than for medical men to confound morbid with normal conditions, and to reason in relation to the laws of life and health from pathological instead of physiological stand-points. This is one and the chief source of the errors and absurdities with which our standard text-books on medical subjects abound. And a similar source of fallacy largely pervades the writings of most authors on other subjects—ethnology, political economy, the sexual relations, population, etc. They do indeed “reason from effect to cause” like a Bacon, but their reasoning too generally stops at the immediate cause of the phenomena they are endeavoring to investigate. They do not, as they should, trace the relations of cause and effect into a system of principles, then harmonize these principles with all other demonstrable truths in science, and lastly trace the whole to some law of Nature as a first premise or fundamental basis.

The majority of philosophers who have speculated on the population question seem to have mistaken poverty and ignorance, with their necessary consequences, sin and misery, as the normal and permanent condition of mankind; and, reasoning from this false premise, they have consistently arrived at conclusions from which all the higher powers of our soul must revolt. A dense population and a scarcity of provisions naturally suggest the idea of a surplus of human beings; but instead of investigating the primary problem—whether

this aggregation of people in a given locality is proper and famine unavoidable ; whether these people live normally or otherwise—our philosophers only think of some plan, in the ways of Providence, or in the order of Nature, or in the disorders of the world, to get rid of the surplus—“to keep the population of the earth down to the level of the means of subsistence.”

The doctrine of MALTHUS—a doctrine which “shocks our reason, insults our moral sense, and blasphemes Deity”—can provide no better method for weeding out the population, as it were, than by the interposition of such special providences as war, pestilence, famine, intemperance, etc., thus making disorder the rule or law of the universe and order the exception. It points to no philosophy but that of expediency, which is no philosophy at all, while it implies that these evils are as enduring as is the earth itself. It ignores every principle and all ideas of progress or improvement in the human race.

THE THEORY OF MR. DOUBLEDAY.—The theory of Mr. DOUBLEDAY is more humane, but equally destitute of any sound philosophical basis. He contends that the great panacea for the evil of a surplus population is a “general plethora;” and this plethora is, of course, the very desirable result of “over-feeding.” According to this rather queer philosophy, a condition of general obstruction or universal constipation—a “general cachexy,” in medical parlance—is the remedy. Over-feeding, Mr. DOUBLEDAY thinks, so deadens the principle of increase that a less number of children will be born among the “high livers.” And here is the usual error of reasoning from the *abnormal* stand-point. Plethora is a diseased condition. It means, simply, defective excretion, hence accumulated effete matter. And although it is very certain that a sufficient degree of over-feeding and consequent plethora will so disorder the system and torpify all the functions as to render that of procreation impossible, it

by no means follows that this is either the law or the accident which has been ordained by the Creator to regulate, or rather to thin out, the population of the earth.

A SELF-ADJUSTING LAW.—The truly philosophical mind can never rest on a doctrine of mere temporary expediency, and the real philanthropist will never be satisfied until he ascertains a law which contains within itself the elements of its own fulfillment. The systems of MALTHUS and DOUBLEDAY do indeed remove a present difficulty, but they involve us in difficulties a thousand times greater. Their “remedies” for excessive population are like the stimulating plan of treating debility, so destructively in vogue by the medical profession. The apparent benefit is invariably succeeded by an aggravation of the complaint, and even the apparent benefit is delusive.

If progress is the fundamental and all-pervading law of the universe, and if the human race is no exception to that law, there is and must be a self-adjusting principle to which mankind will eventually attain. Otherwise there can be no millennial period this side of “the future state;” no rational basis on which to predicate any great reform among men, or advancement of the whole human family in knowledge, virtue and happiness.

“A NEW THEORY OF POPULATION.”—Under this title Messrs. FOWLER & WELLS, of No. 389 Broadway, New York, in 1857, republished from the *Westminster Review* a small book which I commend to the reader. It ably reviews the doctrines of MALTHUS and DOUBLEDAY, and advances an entirely new theory which is well sustained by facts and logic. The author, however, finds the usual difficulty in defining Life and in drawing the line of demarkation between organized and inorganic matter. Indeed, not being able to find a satisfactory distinction, he assumes that there is none in Nature, and defines Life to be the “co-ordination of actions”—a definition

that will apply just as well to earths, oxides, salts, minerals, etc., as to plants and animals. Says the author :

“Some clear idea of the Nature of Life itself must, indeed, form a needful preliminary. We may be sure that a search for the influences determining the maintaining and multiplication of living organisms, can not be successfully carried out unless we understand what is the peculiar property of a living organism—what is the widest generalization of phenomena that indicate life. By way of preparation, therefore, for the Theory of Population presently to be developed, we purpose devoting a brief space to this prior question.

“And here we are at once met by the difficulty, that the widest, and it would appear also, the best definition of Life, is one that includes both the organic and inorganic. Startling though the assertion will be to most, it nevertheless seems true, that, as COLERIDGE or rather SCHELLING, points out the characteristic which, manifested in a high degree, we call Life, is a characteristic manifested only in a lower degree by so-called inanimate objects. And hard as it is to believe this, yet the discoveries of chemists, who find that the alleged distinction between organic and inorganic compounds does not hold good, and the discoveries of physiologists, who are rapidly narrowing the once broad boundary line between the two divisions, day after day, serve to confirm it. Hence, in seeking for a definition that shall distinguish organic existence from inorganic existence, we must not expect to find one that will be rigidly true in all cases. For if there is not such a line of demarkation in Nature, no ingenuity of ours can establish one. All we can hope for is, some expression that shall conveniently classify the two, and shall be generally, though not universally applicable.”

I am of the opinion that Nature has made the distinction ; and so plain, too, that no one will ever mistake, who observes from the correct stand-point. A law of Nature which is not “rigidly true in all cases,” is no law at all ; and to classify the organic and inorganic world by characteristics which are essentially the same, only manifested in a higher degree in the former, is, philosophically expressed, pure nonsense.

The line of demarkation between living and dead matter, between organic and inorganic—modern chemical and physiological researches to the contrary notwithstanding—is as clear, plain, broad and distinct as is possible between any two

exact opposites. And when chemists and physiologists fully comprehend the fundamental difference between chemical and vital actions, there will no longer be any difficulty in relation to this perplexing subject.

Chemical actions are mere accretions and separations in the atoms of matter—their combinations and decompositions. Vital actions are very different. They are the *transformations* of matter as I have already explained. Living organisms *transform* (not combine) air, water and food into tissues, structures and organs, while inorganic matter does nothing of the sort.

Says our author again :

“The growth of a crystal, which is the highest inorganic process we are acquainted with, involves but one action—that of accretion. The growth of a cell, which is the lowest organic process, involves two actions—accretion and disintegration—repairs and waste—assimilation and oxidation.”

The author has stated the exact line of demarkation without perceiving it. Had his mind been relieved of the prejudice that actions within the domain of vitality are in some sense *chemical*, he could not have overlooked the significance of his own words. Now increase of bulk by accretion, and by the development of cells, is precisely the distinction between organic and inorganic matter. “Repair and waste” are the distinguishing processes of all living things. But when the author conjoins the terms, “accretion and disintegration,” and “assimilation and oxidation,” he confounds his chemistry and physiology after the manner of the standard authors. There is no “accretion,” nor “oxidation,” in the proper sense of those terms, in living structures. The proper expression is, *assimilation* and *disintegration*—terms which imply digestion, circulation, absorption, respiration, secretion and excretion, each of which is a distinguishing characteristic of organic matter, and all of which are unknown in the inorganic world.

Our author distinguishes the higher organisms from the lower by the greater complexity of the co-ordinations. He

had better said by the greater variety and complexity of organs and functions.

The facts on which the author builds his "new theory" are interesting :

"On contemplating its general circumstances, we perceive that any race of organisms is subject to two sets of conflicting influences. On the one hand by natural death, by enemies, by lack of food, by atmospheric changes, etc., it is constantly being destroyed. On the other hand, partly by the strength, swiftness and sagacity of its members, and partly by their fertility, it is constantly being maintained. These conflicting sets of influences may be conveniently generalized as : The forces destructive of race, and the forces preservative of race.

"While any race continues to exist, the forces destructive of it and the forces preservative of it must perpetually tend toward equilibrium. If the forces destructive of it decrease, the race must gradually become more numerous, until, either from lack of food or from increase of enemies, the destroying forces again balance the preserving forces. If, reversely, the forces destructive of it increase, then the race must diminish until, either from its food becoming relatively more abundant, or from its enemies dying of hunger, the destroying forces sink to the level of the preserving forces. Should the destroying forces be of a kind that can not be thus met (as great change of climate), the race, by becoming extinct, is removed out of the category. Hence, this is necessarily the *law of maintenance* of all races, seeing that when they cease to conform to it they cease to be.

"Now the forces preservative of race are two—ability in each member of the race to preserve itself, and ability to produce other members—power to maintain individual life and power to propagate the species. These must vary inversely. When from lowness of organization, the ability to contend with external dangers is small, there must be great fertility to compensate for the consequent mortality, otherwise the race must die out. When, on the contrary, high endowments give much capacity of self-preservation, there needs a correspondingly low degree of fertility. Given the dangers to be met as a constant quantity ; then, as to the ability of any species to meet them must be a constant quantity too, and as this is made up of the two factors—power to maintain individual life and power to multiply—these can not do other than vary inversely.

"To show that observed phenomena harmonize with this *a priori* principle seems scarcely needful. But, though axiomatic in its character, and therefore incapable of being rendered more certain, yet illustrations

of the conformity to it which Nature everywhere exhibits, will facilitate the general apprehension of it.

“In the vegetable kingdom we find that the species consisting of simple cells exhibit the highest reproductive power. The yeast fungus, which in a few hours propagates itself throughout a large mass of wort, offers a familiar example of the extreme rapidity with which these lowly organisms multiply. In the *Protococcus nivalis*, a microscopic plant which in the course of a night reddens many square miles of snow, we have a like example; as also in the minute *Algæ* which color the water of stagnant pools. The sudden appearance of green films on damp, decaying surfaces, the spread of mold over stale food, and the rapid destruction of crops by mildew, afford further instances. If we ascend a step to plants of appreciable size, we still find that in proportion as the organization is low the fertility is great. Thus of the common puff-ball, which is little more than a mere aggregation of cells, FRIES says: ‘In a single individual of *Reticularia maxima*, I have counted (calculated?) 10,000,000 sporules.’ From this point upward, increase of bulk and greater complexity of structure are still accompanied by diminished reproductive power; instance the *Macrocystis pyrifera*, a gigantic seaweed, which sometimes attains a length of fifteen hundred feet, of which CARPENTER remarks: ‘This development of the nutritive surface takes place at the expense of the fructifying apparatus, which is here quite subordinate.’ And when we arrive at the highly organized exogenous trees, we find that not only are they many years before beginning to bear with any abundance, but that even then they produce, at the outside, but a few thousand seeds in a twelvemonth. During its centuries of existence, an oak does not develop as many acorns as a fungus does spores in a single night.

“Still more clearly is this truth illustrated throughout the animal kingdom. Though not so great as the fertility of the Protophyta, which, as Professor HENSLOW says, in some cases passes comprehension, the fertility of the Protozoa is yet almost beyond belief. In the polygastric animalcules spontaneous fission takes place so rapidly that ‘it has been calculated by Professor EHRENBURG that no fewer than 268,000,000 might be produced in a month from a single *Paramecium* ;’ and even this astonishing rate of increase is far exceeded in another species, one individual of which, ‘only to be perceived by means of a high magnifying power, is calculated to generate 170,000,000 in four days.’ Among the larger organisms exhibiting this lowest mode of reproduction under a modified form—that of gemmation—we see that, though not nearly so rapid as in the Infusoria, the rate of multiplication is still extremely high. This fact is well illustrated by the polyypes; and in the apparent

suddenness with which whole districts are blighted by the Aphis (multiplying by internal gemmation), we have a familiar instance of the startling results which the parthenogenetic process can achieve. Where reproduction becomes occasional instead of continuous, as it does among higher creatures, the fertility equally bears an inverse ratio to the development. 'The queen ant of the African *Termites* lays 80,000 eggs in twenty-four hours; and the common hair worm (*Gordius*) as many as 8,000,000 in less than one day.' Among the *Vertebrata*, the lowest are still the most prolific. 'It has been calculated,' says CARPENTER, 'that above a million of eggs are produced at once by a single codfish.' In the strong and sagacious shark comparatively few are found. Still less fertile are the higher reptiles. And among the Mammalia, beginning with small Rodents, which quickly reach maturity, produce large litters, and several litters in the year; advancing step by step to the higher mammals, some of which are long in attaining the reproductive age, others of which produce but one litter in a year, others but one young one at a time, others who unite these peculiarities; and ending with the elephant and man, the least prolific of all, we find that throughout this class, as throughout the rest, ability to multiply decreases as ability to maintain individual life increases.

"The *a priori* principle thus exemplified has an obverse of a like axiomatic character. We have seen that for the continuance of any race of organisms it is needful that the power of self-preservation and the power of reproduction should vary inversely. We shall now see that, quite irrespective of such an end to be subserved, these powers could not do otherwise than vary inversely. In the nature of things, species can subsist only by conforming to this law; and equally in the nature of things they can not help conforming to it."

Arriving at the conclusion that "Individuation and Reproduction are antagonistic," the author quotes largely from CARPENTER and OWEN in explanation of the various methods of propagation among the lower animals, and then argues forcibly, if not conclusively, in favor of the superior powers of self-preservation enjoyed by the human race over the animal kingdom:

"Higher organisms are distinguished from lower ones partly by bulk and partly by complexity. This complexity essentially consists in the mutual dependence of numerous different organs, each subserving the lives of the rest, and each living by the help of the rest. Instead of

being made up of many like parts, performing like functions, as the Crinoid, the Star-fish, or the Millipede, a vertebrate animal is made up of many unlike parts performing unlike functions. From that initial form of a compound organism, in which a number of minor individuals are simply grouped together, we may, more or less distinctly, trace not only the increasing closeness of their union, and the gradual disappearance of their individualities in that of the mass, but the gradual assumption by them of special duties. And this 'physiological division of labor,' as it has been termed, has the same effect as the division of labor among men. As the preservation of a number of persons is better secured when, uniting in a society, they severally undertake different kinds of work, than when they are separate, and each performs for himself every kind of work; so the preservation of a congeries of parts, which, combining into one organism, respectively assume nutrition, respiration, circulation, locomotion, as separate functions, is better secured than when those parts are independent, and each fulfills for itself all these functions.

"But the condition under which this increased ability to maintain life becomes possible is that the parts shall cease to separate. If they are perpetually separating, it is clear that they can not assume mutually subservient duties. And it is further clear that the more the tendency to separate diminishes, that is, the larger the groups that remain connected, *the more minutely and perfectly can that subdivision of functions, which we call organization, be carried out.*

"Thus we see that in its most active form the ability to multiply is antagonistic to the ability to maintain individual life, not only as preventing increase of bulk, but also as preventing organization."

ABILITY TO MAINTAIN INDIVIDUAL LIFE.—The author whose work we are considering, lays down and apparently demonstrates the proposition that the nervous system is with all animals and with man the criterion by which to determine the power of self-preservation:

"We found it to be the necessary law of maintenance of races, that the ability to maintain individual life and the ability to multiply vary inversely. But the ability to maintain individual life *is in all cases measured by the development of the nervous system.* If it be in good visceral organization that the power of self-preservation is shown, this implies some corresponding nervous apparatus to secure sufficient food. If it be in strength, there must be a provision of nerves and nervous centres

answering to the number and size of the muscles. If it be in swiftness and agility, a proportionate development of the cerebellum is presupposed. If it be in intelligence, this varies with the size of the cerebrum. As in all cases co-ordination of actions constitutes the life, or, what is the same thing, the ability to maintain life; and as throughout the animal kingdom this co-ordination, under all its forms, is effected by nervous agents of some kind or other; and as each of these nervous agents performs but one function, it follows that in proportion to the number of the actions co-ordinated must be the number of nervous agents. Hence the nervous system becomes the universal measure of the degree of co-ordination of actions; that is, of the life, or ability to maintain life. And if the nervous system varies directly as the ability to maintain life, it *must* vary inversely as the ability to multiply."

APPLICATION.—The law which the author traces throughout the universal kingdom is applied to mankind, with the following truly philosophical remarks :

"From the fact that the human race is in a state of transition, we may suspect that the existing ratio between its ability to multiply, and its ability to maintain life, is not a constant ratio. From the fact that its fertility is at present in excess of what is needful, we may infer that any change in the ratio will probably be toward a diminution of fertility. And from the fact that, on the whole, civilization increases the ability to maintain life, we may perceive that there is at work some influence by which such diminution is necessitated. Before inquiring for this influence, let us consider what directions an increase of ability to maintain life may take—what scope there is for an increase. In some further development of the co-ordinating system, that is, in some greater co-ordination of actions, the increase must of course consist. But there are several kinds of co-ordination; and it will be well to ask of what kind or kinds increase is most requisite, and therefore most likely. For, doubtless, in conformity with the general law of adaptation, increase will take place only where it is demanded.

"Will it be in strength? Probably not. Though from pre-historic remains, we may gather that the race has become more bulky, yet the cause of this change seems now diminishing. Mechanical appliances are fast supplanting muscular force, and will most likely continue to do so until they leave to be done by manual labor only as much as is needful for the healthy maintenance of the body at its then attained size.

"Will it be in swiftness or agility? Probably not. In the savage these form important elements of the ability to maintain life; but in the

civilized man they subserve that end in quite a minor degree, and there seems no circumstance likely to necessitate an increase of them.

“Will it be in mechanical skill, that is, in the better co-ordination of complex movements? Most likely in some degree. Awkwardness is continually entailing injuries and loss of life. Moreover, the complicated tools developed by civilization are constantly requiring greater delicacy of manipulation. Already the cerebellum, which is the nervous centre directing compound motions, is larger in man than in any other creature except the elephant; and the daily-increasing variety and complexity of the processes he has to perform, and the appliances he has to use, may be expected to cause a further growth of it.

“Will it be in intelligence? Largely, no doubt. There is ample room for progress in this direction, and ample demand for it. Our lives are universally shortened by our ignorance. In attaining complete knowledge of our own nature, and of the nature of surrounding things—in ascertaining the conditions of existence to which we must conform, and in discovering means of conforming to them under all variations of seasons and circumstances—we have abundant scope for intellectual culture, and urgent need for intellectual development.

“Will it be in morality, that is, in greater power of self-regulation? Largely, also; perhaps most largely. Normal conduct, or in other words, conduct conducive to the maintenance of perfect and long-continued life, is usually come short of more from defect of will than of knowledge. To the due co-ordination of those complex actions which constitute human life in its civilized form, there goes not only the prerequisite—recognition of the proper course, but the further prerequisite, a due impulse to pursue that course. And on calling to mind our daily failures to fulfill often-repeated resolutions, we shall perceive that lack of the needful desire, rather than lack of the needful insight, is the chief cause of faulty action. A further endowment of those feelings which civilization is developing in us—sentiments responding to the requirements of the social state—emotive faculties that find their gratifications in the duties devolving on us—must be acquired before the crimes, excesses, diseases, improvidences, dishonesties, and cruelties that now so greatly diminish the duration of life, can cease.”

CONCLUSION.—The conclusion of the author is precisely what every philanthropist would rejoice to have demonstrated :

“There now remains but to inquire toward what limit this progress tends. Evidently, so long as the fertility of the race is more than suf-

ficient to balance the diminution by deaths, population must continue to increase; so long as population continues to increase, there must be pressure on the means of subsistence; and so long as there is pressure on the means of subsistence, further mental development must go on, and further diminution of fertility must result. Hence, the change can never cease until the rate of multiplication is just equal to the rate of mortality; that is, can never cease until, on the average, each pair brings to maturity but two children. Probably this involves that each pair will rarely produce more than two offspring; seeing that with the greatly increased ability to preserve life, which the hypothesis presupposes, the amount of infant and juvenile mortality must become very small. Be this as it may, however, it is manifest that, in the end, pressure of population and its accompanying evils will entirely disappear; and will leave a state of things which will require from each individual no more than a normal and pleasurable activity. That this last inference is a legitimate corollary will become obvious on a little consideration. For, a cessation in the decrease of fertility implies a cessation in the development of the nervous system; and this implies that the nervous system has become fully equal to all that is demanded of it—has not to do more than is natural to it. But that exercise of faculties which does not exceed what is natural, constitutes gratification. Consequently, in the end, the obtaining of subsistence will require just that kind and that amount of action needful to perfect health and happiness.

“Thus do we see how simple are the means by which the greatest and most complex results are worked out. From the point of view now reached, it becomes plain that the necessary antagonism of individuation and reproduction not only fulfills with precision the *a priori* law of maintenance of race, from the monad up to man, but insures the final attainment of the highest form of this maintenance—a form in which the amount of life shall be the greatest possible, and the births and deaths the fewest possible. In the nature of things the antagonism could not fail to work out the results we see it working out. The gradual diminution and ultimate disappearance of the original excess of fertility could take place only through the process of civilization; and, at the same time, the excess of fertility has itself rendered the process of civilization inevitable. From the beginning, pressure of population has been the proximate cause of progress. It produced the original diffusion of the race. It compelled man to abandon predatory habits and take to agriculture. It led to the clearing of the earth's surface. It forced men into the social state; made social organization inevitable. and has developed the social sentiments. It has stimulated to progressive improvements in production, and to increased skill and intelligence. It

is daily pressing us into closer contact and more mutually dependent relationships. And after having caused, as it ultimately must, the duo peopling of the globe, and the bringing of all its habitable parts into the highest state of culture; after having brought all processes for the satisfaction of human wants to the greatest perfection; after having, at the same time, developed the intellect into complete competency for its work, and the feelings into complete fitness for social life; after having done all this, we see that the pressure of population, as it gradually finishes its work, must gradually bring itself to an end."

It has long been quite a prevailing opinion with many learned men, that nations, like individuals, are "born to die;" that they may live, grow, develop—increase in knowledge, wealth and power—to a certain point, and then they must decline and perish. That such has been the fate of most of the nations of history is but too true; but the fact no more proves the necessity than the almost universally diseased condition of the human race proves that disorder is the order of Nature. Professor YOUNG and others who have written on the new philosophical theory of the "Correlation of Forces" take this view of the subject, and therein, I think, *misapply* the new and beautiful theory.

Professor YOUNG, reasoning wholly from the material stand-point, comes to the very absurd, non-progressive and soul-chilling conclusion that morality and intelligence are "correlative" in the same sense that heat, light, electricity and magnetism are; that virtue and liberty are correlative and convertible with vice and slavery; that when these qualities or conditions appear in one nation or among one people, there is a corresponding declension somewhere else, and *vice versa*; thus degrading the elements of immortality and eternal progress to the level of and subject to the conditions and laws—and to those only—which govern the inorganic world. It has long been the error of philosophers to confound vital forces and laws with the forces and laws of inorganic matter. Mental and moral qualities have no correlation to their opposites, any more than God and Heaven are correlated with their opposites.

As nations are constituted of societies, and as societies are aggregated individuals, it follows that the character and vitality of the nation must correspond with that of the people who compose it. No nation ever did or ever can decline and die, until infirmity and disease are indelibly stamped on the masses of the people. No nation can avoid the fate of Rome, of Carthage, of Greece, when wealth has led to luxury, and luxury to dissipation. The Health Reformers are, therefore, the only ones who can hasten on the millennial period so philosophically indicated by the author of the "New Theory of Population."

CHAPTER XIV.

THE LAW OF SEXUAL INTERCOURSE.

THE PRIMARY QUESTION.—In considering the subject to which this chapter will be devoted, the first important question to settle is the object of sexual intercourse—what does Nature intend to accomplish by it? So far as the animal kingdom (or the *lower* animals, as some prefer to term the brute creation) is concerned, the problem presents no difficulty. To propagate the species is the whole of it. With all animals sexual intercourse is a mere generative act. But is it so with man? This is a question that will be, must be, and should be investigated; for, whatever is the law established in the constitution of human beings, it is for their highest good to understand and obey it.

There are those who, reasoning from the premises that vital laws are essentially the same in all living organism, have arrived at the conclusion that whatever is the law of sexual intercourse in relation to animals must also apply to human beings. So far as the individual functions are concerned, and indeed, so far as all of the vital functions *merely* are concerned, this conclusion is incontrovertible. But in applying it to human beings we can not ignore its moral and religious bearings. Hence others, who have examined the subject with an equally truth-seeking spirit, have come to the opinion that sexual intercourse is, with human beings, intended as a love act as well as a generative act. The question has fairly two sides; and the data which apply to its solution are extremely difficult to be found, because of the abnormal habits and perverted instincts of nearly the whole family of mankind.

Whatever views may be entertained with regard to the

philosophy of the New Theory of Population presented in the preceding chapter, all physiologists will doubtless agree that, in a higher and better condition of society, the number of children born will be diminished, while their quality will be correspondingly improved. It is equally evident, also, that when the physiology of menstruation is perfectly understood (including the knowledge of the times when the woman is or is not liable to impregnation), a single act of coition will suffice to beget a single child; and that, therefore, on the theory that sexual intercourse is intended by Nature merely for the purpose of reproduction, it follows that the acts of intercourse should be, "in the good time coming," limited to the number of offspring. Such is the legitimate result of the theory carried to its ultimatum. And that we shall eventually, if not soon, arrive at this knowledge is not only possible but probable. With regard to domestic animals whose sexual instincts are less depraved, our knowledge on this subject is well-nigh perfect—certainly sufficient for all practical purposes. It rarely happens that the breeders of domestic animals do not know when to bring the sexes together for fruitful coition.

But, admitting that we should never make any further advancement in knowledge with regard to the time and conditions for fruitful coition, and that women continue to the end of the world to have as many children as heretofore (or even two or three times as many, so far as our argument is concerned), on the theory that sexual intercourse has normally no purpose or object except to fecundate the ovum, the exercise of the sexual organs of the male would be (compared with present customs) extremely limited. Pregnancy very frequently results from the first sexual embrace with married couples, and sometimes in the case of those who are not married. Of course there should be, in these cases, no repetition of the sexual act until after the periods of gestation and lactation are completed—nearly two years from the date of conception, and then again a single coitus might result in

another pregnancy, and so on. No doubt such a doctrine, or rather such a practice, would be "perfectly shocking" to the majority of people, who have been educated to regard sexual intercourse more in the light of a lust indulgence than a love embrace.

Whether human beings would be satisfied with, or would submit to a life of such continence and utilitarianism, is not here to be discussed. If the principle is true it should be taught, let human beings do what they will.

We can not refer the decision of this question to the desires of the human instincts or propensities, as we can with regard to animals, for the reason that those instincts are depraved and perverted, while these are normal. I have no manner of doubt that, in a perfectly normal condition, the instincts of human beings (the sexual propensity not excepted) are infallible guides, just as they are with unperverted animals. The greater includes the less. Man has all the instincts of all the creatures below him with other powers superadded. And if he were in all respects possessed of "a sound mind in a sound body," he would never desire sexual intercourse, more than he would food or drink, except when it was best both for himself and the woman to whose desire he would respond. But as we have no such persons to serve as models of what men should be, we must do the best we can with such data as the disordered world affords us.

Animals are never progressive. They do not improve from generation to generation. They manifest no disposition to do more than supply themselves with food, maintain existence as their ancestors have done, and propagate their kind.

Human beings are always progressive. They are ever altering (sometimes for the worse, perhaps), changing, the object being to improve and perfect; this object obviously implies society, traffic, schools, moral culture, religious influences, and provision for the future; all of these necessitate the family relation; and the family relation implies one man and one woman as its source and head.

As animals do not progress from age to age, and have no mental organs (ideality, hope, conscientiousness) to relate them to beings in other spheres of existence and to another life, and as they can make but little provision against the elements, or for preserving food, their sexual passions are necessarily governed by the seasons.

Man, by looking forward to an eternity of existence, provides the means which are to benefit himself or his successors for generations, centuries and ages to come. In a great measure he controls the elements. To a great extent he is superior to circumstances. And while spring-time and harvest enable him to lay up stores of food from the well-tilled earth, the winter season affords him the best opportunity for moral and intellectual culture ; and, by means of houses rendered comfortable at all seasons, his sexual desires and relations seem to be placed on a very different plane from those of the animal kingdom.

There can be no question that the most perfect organization of the offspring requires the most complete commingling of elements, or magnetism, or whatever else the parents impart or contribute in the sexual embrace, and that there should be the most perfect harmony and enjoyment with each other. They should be as much *at-one-ment* as possible, so that, at the moment of conferring life upon a new being, each should almost lose, in the intensity of pleasurable sensation, the consciousness of individual or independent existence. I can not understand how this condition can be so well acquired and maintained as by *temperate* sexual indulgence, even when offspring are not desirable nor proper. But what *is* temperate indulgence may not be so easily determined.

THE SOCIAL VICE.—Between love and lust it may not always be easy to draw the line of demarkation. It would not be difficult to give those who need none a rule for sexual indulgence. They, being in a normal condition, are a law unto themselves. They may safely follow their inclinations in this

respect as in all others. But with the great masses of the people the only rule of conduct is appetite, and this is to a great extent morbid. Hence, sexual intercourse, in the homes of the married and respectable, as well as in the dens of prostitution, is indulged in more to appease a morbid craving than to gratify a normal instinct, as gluttony, tobacco and alcoholic liquors are indulged more to stifle for the moment an insatiate and intolerable irritation, than for any pleasure or gratification resulting from them.

The fearful and increasing prevalence of "the Social Vice," especially in all the large cities of the world, is one of the problems whose existence our philanthropists deplore, while they see no way to deal with it practically. One of our city papers has recently proposed that, as the evil can not be removed, it should be mitigated and regulated by the license system as it is in Paris; and one of our leading city dailies lately suggested the same plan to apply to the city of Washington. It has too long been the custom of statesmen, when they find it difficult to suppress evils, to make a compromise with conscience, and derive a revenue by "regulating" them. The result has always been a temporary alleviation of some of the evils resulting from the unlicensed vice, while fastening the licensed vice more permanently on society. This has been the case with the liquor traffic and the tobacco trade, and may be with the traffic in character and chastity.

In all of these cases the remedy lies further back. It should be directed to the *causes* rather than to the effects. If young women were allowed equal opportunities with young men for education and occupation, one-half of the sum total of the causes of prostitution would be removed at once; and if the young of both sexes were educated and trained Hygienically—taught to eat, drink, dress and exercise properly—the remaining moiety would be very nearly done away. It is impossible to educate people into sensuality and restrain them in the indulgence of it. Society has no moral right to regulate nor license any thing that is intrinsically wrong, nor has

it any moral right to punish its debauchees and vagabonds until it removes temptation from them, and provides the means by which they can secure a comfortable livelihood by honest labor. Until this is done, I have no faith whatever in regulations or licenses on the one hand, nor in pains and penalties on the other.

THE SOLITARY VICE.—Terrible as are the bodily diseases and moral ruin which result from the Social Vice, it may be questioned whether the infirmity and degradation of the human race from the "Solitary Vice" is not the greatest of the two evils. Habits of self-pollution, which attracted the attention of philanthropists in the early days of Health Reform, and elicited the instructive writings of GRAHAM, ALCOTT, the FOWLERS and others, are still more prevalent now. The only remedy for this evil, as well as for that of prostitution, lies in a health education of the people in the broadest acceptance of the term.

The manner in which the great majority of American children are fed, if it does not ruin their digestive organs and render them dyspeptics or consumptives, is sure to produce permanent congestion, with constant irritation in the pelvic viscera, resulting in a precocious development and morbid intensity of amativeness. Tea, coffee, flesh meats, to say nothing of the abominations of the baker and confectioner, are sufficient to account for the early tendency to sexual dissipation and debauchery manifested by a large portion of the children in our primary schools. Many a parent, now confiding in the purity and safety of his own son or daughter, might be appalled if he should investigate this subject.

SHAKERISM.—In view of the prevalence of vice, crime, disease and degradation resulting from perverted amativeness, and the miseries and discontent so rife in married life, one can hardly wonder at the "extreme measures" which have been proposed as a remedy for these evils. The Shakers

have certainly gone to the root of the matter, and I fear a little beyond. There is such a thing in jurisprudence as "proving too much;" and while our Shaker friends (who are excellent people, and generally more intelligent with regard to the conditions of health—certainly more observant than most religious denominations) have adopted a system which will, if universally adopted, assuredly *prevent* all the evils which have their origin in sexual abuses, it must be at the expense of existence itself. It is like "curing the disease by killing the patient." It is true that the Shakers base their creed on the "Bible argument," as do the Mormons, whose male members appropriate to themselves an unlimited number of females, and as do the Oneida Communists, who advocate sexual intercourse for its own sake and repudiate the marriage relation; but in these days of enlightenment it behooves the teachers of all religious systems to square the teachings of their Bible with the Book of Nature and the Laws of the Universe. The laws of Nature, as we interpret them, and some passages in the Bible, in their literal statements, may contradict each other; yet both may be true. And when Science and Scripture seem to conflict, before throwing either away, we should seek for an explanation which will reconcile them. The principles of Science *are* true; they are themselves manifestations of the laws of Nature, as these are manifestations of the attributes of Deity. Hence, no truly philosophical mind can ignore any demonstrable truth of Science, whatever may become of the Bible. The remedy, therefore, for infidelity is not in denying or ignoring scientific data, but in so interpreting Scripture as to harmonize both.

If sexual intercourse has, in the order of Nature, a use, no argument drawn from its abuse can avail any thing. When the Power that "created the heaven and the earth" desires to have the world or the race come to an end, or when He desires that human beings shall be propagated and perpetuated on the earth by "spiritual generation," or by some method different from sexual commerce, I have faith in God and Nature

to believe that the laws which will determine such results will be made so manifest that no one can possibly mistake them.

Sexual intercourse is condemned by the Shakers because of its sensuality—its degrading and unspiritualizing tendency. It was the means for perpetuating the species under the “old Adamic” dispensation, which Christ, the “new Adam,” came to destroy or supersede. Such logic is very like declaring eating and drinking (and who has better victuals and drink than the Shakers?) depraving and demoralizing, because a majority of the human race have made themselves dyspeptics or gluttons by eating and drinking improperly. True physiology teaches that there is nothing low, nothing base, nothing degrading, nothing demoralizing, nothing sensualizing, nothing impure in the normal exercise of any faculty or propensity with which human beings are endowed.

The phrases, “animal passions,” “lower propensities,” “brutal lusts,” etc., have been so frequently applied to the perversions of amativeness, that many persons, perhaps the majority, have acquired the habit of associating the idea of vulgarity and indecency with sexual intercourse. It is very true that nothing can be more vulgar, indecent and degrading than its abnormal or merely lustful indulgence. But it is equally true that, normally exercised, no act of an intelligent being is more holy, more humanizing, more ennobling. Perverted conscientiousness—conscientiousness misled by an erring intellect—has tortured human beings at the inquisition, burned them at the stake, and destroyed them in all the cruel methods that human ingenuity could contrive. Yet no one terms conscientiousness a base or brutal propensity; nor would they apply such an epithet to any mental power, if they justly discriminated between its use and its abuse.

THE ONEIDA COMMUNISTS.—While the Shakers are opposed to sexual intercourse on Bible grounds, for all purposes, as wrong *per se*, a society exists in the interior of the State of New York, with a branch at Wallingford, Connecticut, whose authors

teach, and whose members profess to practice, sexual intercourse because it is right *per se*, offspring being a matter which they claim the right to choose or refuse. They, too, present a plausible theory, derived mainly from Scriptural data, in support of their creed. The Communists repudiate the marriage relation as the slavery of woman—the ownership of a woman by a man. But here again the abuse seems to be made the occasion for condemning the use. That our marriage laws are sadly defective is most true, inasmuch as they recognize woman's *inequality* and place her, in the married relation, at a disadvantage. But to repudiate marriage and advocate promiscuous sexual intercourse, as remedies for this kind of slavery, seems to me like the opposite extreme of the error of the Shakers. These would do away evil by doing away with the perpetrators of evil, and those would correct the miseries and infelicities of married life by abrogating the marriage institution.

It is most true that statutes and ceremonies can neither marry nor unmarry in the proper sense of the term. They can only record and publish the fact that the parties are married, or at least consider themselves to be. But in our multiplied social relations, and in the complicated business transactions of the world, this public recognition of the relation of the parties has many and important uses.

The Communists believe that sexual intercourse is calculated to develop themselves and augment their happiness, independent of all considerations of offspring; hence sexual intercourse, so practised as to avoid pregnancy, is with them not only a privilege but a duty. But they do not propose that the "twain shall become one flesh," in the ordinary understanding of this phrase. When children are desired, the best specimens of the flock—male and female—are to associate together for the purpose; but for purposes of personal enjoyment and mutual improvement, intercourse is to be promiscuous, or at least interchangeable.

In favor of this system, the teachings and examples of

good men in the past ages are adduced, as well as the teachings of Christ in relation to the "hereafter." And because in Heaven there is no "giving in marriage," it is inferred that there should be none on earth.

I can see no more reason in going to the "future state" for our rules of conduct than I can for going to the past. We might as well imagine what people did, in the pre-Adamic age, or before they came into the present state of existence, and undertake to adopt their habits and fashions, as to speculate on the manners and customs of the people of

"That undiscovered country from whose bourne
No traveler returns."

It is quite enough for us to "live, move and have our being" according to the laws to which our vital and mental organisms are related in this life; and the more perfectly we can fulfill all the laws of our being here, the better prepared shall we be to enter upon the life hereafter.

The Oneida Communists, like the Shakers, are a highly moral and religious community. No one can impeach the honesty or conscientiousness of either, and as their systems are based essentially on religious convictions, they would naturally attract those of a more devotional tendency of mind, who would submit to almost any condition of pain or pleasure if convinced that it was in the line of duty.

All persons will admit that if the world was sufficiently developed, the principles of the Communists would be both proper and practicable. A society whose members are all disposed to act conscientiously, to investigate all subjects candidly, to follow the light that is in them, "in honor preferring one another," in short, "doing unto others as they would have others do unto them," do not need forms, ceremonies, statutes, courts, government, nor institutions of any kind. And so far as individuals can attain to this higher standard of life, they are prepared for communism, or to work out their destiny without it.

MORMONISM.—Like the Shakers and the Communists, the Mormons of Utah profess to derive the principles of their creed from the Bible. Polygamy was practised in ancient times by good men; the fact is recorded in that book; *ergo*, the Bible *teaches* polygamy! Such is about the substance of all the logic we have on the subject. It is the old error of mistaking a permission (permission to do wrong and to take the consequences) for a mandate. The advocates for flesh diet, and for alcoholic liquors, misapply the teachings of the Scriptures in the same manner. But the question that especially concerns us in this discussion is the physiological bearings of polygamy as practised by the Mormons.

The argument derived from the polygamous practices of the lower animals proves too much. In some instances one male will cohabit with several females, and in other instances one female cohabits with several males. If the Mormons who quote natural history to sustain their peculiar institution would give us all the facts in the case, the argument would be conclusive against them. How would it suit them to permit the women to choose their husbands, one or more, as fancy, interest, caprice, ambition or passion dictated? There is no better test of the righteousness of any principle or system than its *working both ways*, so far as the sexual relations are concerned. An institution which degrades man or woman, or which places them in society, or before the law, on unequal terms, can not be right—unless humanity itself is wrong. And I only introduce the subject of Mormonism into this chapter for the purpose of indicating the remedy for its polygamous feature—a remedy which our politicians have been seeking for several years in vain. This remedy is the recognition, by the Constitution of the United States, of *woman's absolute and unconditional political equality*.

It is a principle well understood by every intelligent physiologist that, in the act of sexual intercourse man imparts, so to speak, more vitality than woman. He can not, other circumstances being equal, sustain himself under frequent repe-

titions of the sexual orgasm so well as woman can. She is, therefore, constitutionally better adapted for several husbands than he is for several wives. And if the sexes must be "unequally yoked together," numerically, the rule which obtains among the Mormons ought to be reversed. And again, if sexual intercourse is necessary to energize all the powers of mind and body, or useful to develop them, the woman has the same needs and the same rights in this respect as man. And in whatever light the subject may be viewed, the conclusion of the physiologist must be that the practice of polygamy, though permitted "for the hardness of men's hearts," is no part of the order of Nature.

CELIBACY.—The question has been discussed whether a married life, or a state of "single blessedness," is most conducive to longevity. It is argued on the one side that, as man imparts more or less of his unreplenishable fund of vitality at each sexual embrace, a life of entire abstinence would be most conducive to a long life and a "green old age." I do not regard the question as very important. For all practical purposes the best life is the longest. The object of living in this earthly tenement—and all the object that I can discover—is to develop our own inherent and God-given powers, and assist others to do so. This development implies the use of bodily organs as the instruments of the mind or soul; and it consists in ascertaining the existence of beings and objects external to ourselves, and our relations to them. From the cradle to the grave this process should go on. Even in the decline of life, when the bodily structures are consolidating, and the vital spark expiring, many persons possess the ability to think, and feel, and reason; they continue to develop almost until the last breath. Others become demented in middle life; while many in youth acquire such morbid conditions that further development in this life is impossible. They have then lived long enough. Who, in the exercise of his reason, would desire to live, even if he had the power to make

provision therefor, for one moment beyond the period of usefulness? Who *could* desire to remain in this earthly tenement for an hour after the capacity to do good or receive good was lost? It is then that Death—the Angel of Mercy, rather than the “King of Terrors”—translates him to another sphere, “to the abodes of more than mortal freedom,” where the development of the powers of the soul commenced on the earth, can go on for ever and ever.

Perhaps the “law of compensation” that pervades the universe is in nothing more beneficently manifested than in the relations and fortunes, the joys and sorrows of married and single persons. Marriage is to a great extent “a lottery,” simply because boys and girls are taught the isolated fact that they must “get married,” without being instructed in the duties or responsibilities of married life. The result is many unhappy marriages. And the same ignorance or miseducation which renders so many marriages miserable, induces or causes many to live unmarried. Each may envy the other; but really there is little to choose. No one will doubt that a *true marriage* is the happiest condition of an earthly existence. But even this is qualified and modified by the disorderly elements of an artificial state of society all around. And the unmarried, while they do not share in the highest joys which human nature is capable of experiencing, are free from many of the cares, trials and afflictions which pertain to married life.

One of the most deplorable signs of the times is the increasing indisposition of the young men of our country, especially in the large cities, to marry. Society *must* demoralize, both sexes must deteriorate under such circumstances. It is easy to point out the causes of this and to indicate the remedy, but it is not so easy to apply the remedy. It is natural for young men to desire a companion for life as soon as they arrive at maturity. If they do not seek such a companion it is because of powerful counter influences. One glance at the condition of the young women of America tells the whole

story. *They are generally infirm in health. They are extravagant in dress.* And these evils are increasing from generation to generation. The young men whose salaries are small, or whose occupations are uncertain, prefer to "endure the ills they have, rather than fly to others they know not of." Who can say they do not act wisely? It is not in human nature—though it may be in human passion—to marry a woman for the sake of nursing an invalid, hiring Bridgets, employing doctors, seeing apothecaries, listening to constant complainings and dancing attendance on the whims and caprices almost inseparably connected with constitutional infirmity and morbid feelings.

Young women have it in their power to arrest the downward tendency of this vice. Let them first of all get a Health education, for without health no woman is fit to be wife or mother. Some fathers and some mothers have had the good sense to send their daughters to the Hygeio-Therapeutic College, as the best possible preparation for matrimony—a preparation which I am certain their husbands and children will never regret. In the second place, they must give some evidence that they can be useful as well as ornamental. They must dress with some regard to use, convenience, economy and good taste, and not appear to be the mere slave of all the ridiculous and ever-changing fashions of the ever-succeeding seasons. Probably no two words in our language can express a greater curse to the human race than those of *fashionable dress*.

It is true that young men dress vainly and foolishly to some extent, and that they are very generally addicted to degrading and ruinous habits in which very few women indulge, for example, tobacco-using. But I blame the young ladies very much for this filthy and detestable habit on the part of the young men. I am of opinion that a man who uses tobacco is not fit to be husband or father. He has no right to make himself indecent and disgusting in the presence of his wife; and he has no right to curse his offspring with the legacy of a depraved organization.

But, if woman was as she should be, she would have a power to lead man in the way he should go, of which she now little dreams. It is, to a great extent, because he does not find in her the qualities which engage his heart and satisfy his judgment, while they please his eye and charm his fancy, that he seeks other associations and other pleasures. He is apt to take her for what she advertises herself to be—a thing of vanity and show; and to seek her company for mere pastime or lust, instead of for refined conversation, elevating sentiments and substantial happiness.

I have no manner of doubt that if the young women of our country would raise themselves above the sphere of fashionable frivolity, they would soon draw the young men after them and away from the low and degrading vices of liquor-drinking and tobacco-using. There would then be few “old maids” among us; but until they do this, there ought to be many.

FREQUENCY OF SEXUAL INTERCOURSE.—On this question there is as much diversity of opinion as on any other that can be named. The only data on which a philosophical answer can be predicated is normal instincts, and these, unfortunately, we do not know where to look for. It is easy to lay down a rule by which all may approximate as nearly as possible to physiological propriety—a life in obedience to the laws of life. The more nearly the parties live in accordance with physiological habits, especially in the matters of food, clothing and exercise, the more nearly normal will be their sexual inclinations, and the less need have they of subjecting their desires to the restraints or control of reason. For those who live riotously; who are constantly goading their sexual passions into abnormal intensity by means of gross food, stimulating viands, and obscene associations, no better rule can be given than the less indulgence the better.

The majority of young persons unite in matrimony with no education whatever on this subject; and habits, right or wrong,

are soon formed which are apt to be continued through life. I have had patients who had for years indulged in sexual intercourse as often as once in twenty-four hours, and some who have indulged still oftener. Of course the result was premature decay, and often permanent invalidism. It was not because these persons were inordinately sensual, or unusually developed in the cerebellum, that they damaged themselves in this way. It was simply because they knew no better. Many a man who would have been a good husband if he had only known how, and who would not for his life, much less for the momentary pleasure it afforded, have endangered the health, or hazarded the happiness of a well-beloved wife, has destroyed her health, happiness and life (some men several wives successively) by excessive sexual indulgence.

Married men are not always as sensual in character, nor as cruel in disposition, as they seem. With many sexual intercourse becomes a habit, like eating, working and sleeping; and they indulge in it with nearly the same regularity that they do in their other habits, reckless and thoughtless of its consequences to themselves or their wives. And it is no uncommon thing for the physician to attend an invalid woman for years whose ailments are chiefly attributable to this habit on the part of her husband. Almost every physician of large practice has a circle of "everlasting patients" whom he visits and prescribes for once a week, on the average, for years; who never get much better at home, but always improve at once when removed to a proper distance from their bosom companions. I do not charge their physicians with remissness in duty in not instructing both parties how to avoid the necessity of employing him professionally, for, generally, physicians are as heedless and as ignorant as the people are on this subject.

One of the reasons why uterine diseases are treated so much more successfully at the Health institutions, watering places, or at any place except home, is because the husband is not

continually thwarting what the doctor or Nature is doing for the patient.

The frequency with which sexual intercourse can be indulged without serious damage to one or both parties, depends, of course, on a variety of circumstances—constitutional stamina, temperament, habits of exercise, occupation, etc. I am of the opinion that few can exceed the limit of once a week without serious detriment to health and a premature old age; while many can not safely indulge oftener than once a month. But as temperance is always the safer rule of conduct, if there must be any deviation from the strictest law of physiology, let the error be on that side.

PLEASURE OF SEXUAL INTERCOURSE.—Whatever may be the object of sexual intercourse—whether intended as a love embrace merely, or as a generative act—it is very clear that it should be as pleasurable as possible to both parties. Indeed, when it is otherwise to either party, unless generation be intended, it is mere lust. Nor can the offspring be as perfect as it should be unless the act is both desired and enjoyed by both parties. This rule or law, for it is a law of Nature, at once suggests the conditions which are necessary to insure this result. There must be mental harmony and congeniality between the parties. Each must be able to respond to the *whole* nature of the other—bodily, morally and intellectually, to that extent that there shall be no sense of discord, no feeling of repugnance; but, on the other hand, an utter abnegation of selfhood.

But let not sexual love be confounded with sexual lust. The former is always gratified and completely satisfied with legitimate indulgence. The latter is like the appetite of the glutton or the drunkard, each indulgence aggravating but never satisfying the desire.

Those who study this subject in the light of physiology, and who practice conscientiously according to the light that is in them, will have no occasion to envy the libertine and

debauchee. They will not fail to be convinced that here, as everywhere, "the ways of wisdom are ways of pleasantness, and all her paths are peace." Those persons whose lives are more simple and pure, who are temperate in all sensuous gratifications, and who indulge the sexual passion moderately, will find the happiness resulting unalloyed, and, in the course of a lifetime, correspondingly more pleasurable and satisfactory. And besides, such persons maintain the integrity of the sexual instincts, with the capacity to enjoy, at a much later period of life, than do those whose indulgences are premature or excessive. Many persons are, sexually, as young at sixty years of age as others are at thirty. Some maintain their virility beyond the age of three-score years and ten, while others exhaust it in half the time.

Here it may be proper, because of its intrinsic importance, to repeat the law already alluded to: "Intensive life can not be extensive." One may so live as to keep all of his "lower propensities"—I mean self-relative—in a state of preternatural excitement, and, mistaking the insatiate cravings of morbid instinct for a "natural necessity," soon exhaust the powers of life by inordinate indulgence. Such has been the history of thousands who have applied to me for professional advice. Had they been properly instructed in early life, their history would have been very different. Had such a book as this been placed in their hands in the days of their youth, it would have been their earthly salvation. How emphatically can the words of the wise man: "Train up a child in the way he should go, and when he is old he will not depart from it," be applied to this subject!

Sexual intercourse should never, under any circumstances, be indulged when either party is in a condition of great mental excitement or depression, nor when in a condition of great bodily fatigue, nor soon after a full meal, nor when the mind is intensely preoccupied; but always when the whole system is in its best condition, and most free from all disturbing influences.

There is good sense and sound philosophy in the words which STERNE causes his hero, TRISTRAM SHANDY, to utter :

“I wish my father or my mother, or indeed both of them, as they were in duty both equally bound to it, had minded what they were about when they begot me ; had they duly considered how much depended upon what they were then doing ; that not only the production of a rational being was concerned in it, but that possibly the happy formation and temperature of his body, perhaps his genius and the very cast of his mind, and perhaps the fortunes of his whole house, might take the humors and dispositions then uppermost. Had they duly weighed and considered all this, and proceeded accordingly, I am verily persuaded I should have made a quite different figure in the world from what the reader is likely to see me. Believe me, good folks, this is not so inconsiderable a thing as many of you think it.”

TIME FOR SEXUAL INTERCOURSE.—The usual habits of sexual intercourse are the worst that the nature of the case admits of, either for the good of the parties themselves or for the benefit of the offspring. The time chosen is usually when darkness reigns over the earth, as though the act was one to be ashamed of (which is true in too many cases), and the part of the night the evening, when, generally, both parties are in their worst bodily and mental conditions. A hard day's work, an indigestible supper, and sexual intercourse, afford the rationale of a multitude of diseases and infirmities on the part of parents, and of deformities, eccentricities and monstrosities innumerable on the part of offspring.

If children are to be begotten, or if that result is either desirable or possible, the sexual embrace should be had in the light of day. It is only then that the magnetic forces and the nervous system are in their highest condition of functional activity, and the body, refreshed by sleep, in its most vigorous condition. But it should not be the hurried act of the early morning, like a hasty meal before a day's work. It is better that it should never be indulged, either early in the morning or late in the evening, but that the time be selected and appropriated for the purpose. As no function in life is

more important, and as the consequences of a single act may be the happiness or misery of a future being, it is worth a little time and preparation. Indeed, it is impossible to name any function for the proper performance of which more elaborate preparation should be made. Yet it is almost the only one for which no preparation is usually made. Surely, if sexual intercourse is worth doing at all, it is worth doing well. And it would not exalt its importance one iota above its real merits, if certain days were set apart, consecrated, to the conjugal embrace. It might be one day in seven, or one day in twenty, or more or less; or if the demands of business or the duties of life do not admit of the requisite leisure, opportunities should be chosen as they present themselves, when the parties are in their most composed and comfortable condition. The rule herein indicated is not so difficult to follow as might seem at first. It only requires that its paramount importance be appreciated, and a disposition enkindled to regard it. "Where there is a will there is a way."

CHAPTER XV.

HEREDITARY TRANSMISSION.

“To avoid the pains,
The disappointments and disgusts of those
Who have an offspring scrofulous and rickety,
The precepts here of a divine old man
I could recite.”

RIGHTS OF OFFSPRING.—Every child that is born into the world has the birthright inheritance of a sound organization. It has, too, as one of the human family, an inherent right to sustenance and education. If despoiled of the former by the ignorance or perversity of its parents, it will surely be revenged; and if robbed of the latter by the errors or imperfections of society, society will assuredly suffer. This is one of the unpardonable sins. There is no forgiveness—certainly not in this life. A vicious, malformed, diseased or perverted child can not exist in the family without “rendering evil for evil,” any more than a vagrant or imbecile person can exist in society without, to some extent, contaminating the whole social atmosphere. This may seem a hard doctrine in its bearings on individuals; but it is true in Nature, and beneficent in its application to the whole human race.

Says Dr. PORTER, in an entertaining and instructive work entitled “Men, Women and Babies,” which I commend to the reader:

“There is to day no better established fact than that all progeny, vegetable or animal, takes its physical, mental and moral qualities from

those which predominate in the parents during the period of conception and gestation. The form, face, temper, disposition and constitution are stamped, at these periods, on the offspring by parents. It is well known that all the secretions partake of both the general and particular states of body and mind; and physicians often judge by them, and so prescribe. It is also by closely observing this law of animated nature that agriculturists preserve the health and improve the breed of their animals. Passing strange is it, however, that this observation was never made applicable to the human species, where its application is more wanted! Yet so it is; we see every day very sensible people, who are anxiously attentive to preserve or improve the health and breed of their horses and cattle, at the same time entailing on their children, not only tainted blood and loathsome diseases, but madness, folly and unworthy dispositions. Even those children so born, are not trained and developed so as to counteract the entailment, but left to grow as they can; and all this, too, in the face of treatment to cattle; and transpiring, too, when they can not plead being stimulated by necessity or impelled by passion. Dr. GREGORY graphically describes the influence of the parental stock in these words: 'Parents frequently live over again in their offspring; for children certainly resemble their parents, not merely in countenance and bodily conformation, but in the general features of their minds, and in both virtues and vices. Thus the imperious CLAUDIAN family long flourished at Rome, unrelenting, cruel and despotic; it produced the merciless and detestable tyrant TIBERIUS, and at length ended, after a course of six hundred years, in the bloody CALIGULA, CLAUDIUS and AGRIPPINA, and then in the monster NERO.'

The principle that the best good of one is the highest interest of all, and *vice versa*—that true benevolence is enlightened selfishness—can have no better illustration than in its application to the rearing of children. And when this principle is generally understood, legislation will be more directed to the *prevention* of crime and less to its punishment. The time, talent and money which the civilized world now expends on its courts, jails, prisons, penitentiaries, asylums, pauper-houses, reform schools and inebriate homes, if applied to the proper training and education of children, would soon do away with the necessity for their existence. And more; war, with its infernal enginery and unutterable horrors, would never again accurse the earth. It is only because the children are not

reared normally and educated physiologically—taught their rights, duties, relations and responsibilities, and cared for by society as a whole—that they grow up to manhood with the spirit of selfishness and violence “growing with their growth and strengthening with their strength;” more ready to quarrel than to reason, more disposed to grasp the thing in dispute than to arbitrate, and more prone to rob and murder than to give and forgive.

There are, for example, in the city of New York, some forty thousand vagrant children. Their parents can not or do not provide for them; and society will not, hence they take care of themselves—do the best they can or the worst they can, for it is all the same. They receive little else than abuse from parents or society, and find little sympathy except among their congenial co-vagabonds. They are compelled to beg or forced to steal; they suffer keenly from the pangs of hunger and the want of clothing and shelter; they know nothing of home as distinct from a prison-den, and they find more comfort and equal respectability in the almshouse or penitentiary. The sense of self-debasement overshadows their spirit continually as with the pall of night, while the consciousness of social degradation, with no hope in the future, weighs down their soul like an incubus. Should any body wonder that, as they grow up to manhood, they become criminals and debauchees? It would indeed be miraculous if they did not.

But rich parents do not like to pay for the care and education of any children except their own; and those who have no children object to “taxation without representation” when asked to contribute to the “nurture and admonition” of their neighbor’s little ones. Both are short-sighted—penny wise and pound foolish. Both pay indirectly for the restraint and punishment of their neighbor’s children twice as much as their education would have cost. They act as wisely as they would if they should all retire within their pleasant domiciles and beautiful parlors to escape the evil consequences of the filthy gutters when our streets have not been cleaned since—“no-

body knows when." If the elements of infection and contagion are in the gutters they will pervade the atmosphere and penetrate the mansions of the wealthy as well as the abodes of the poor. And so long as human beings are permitted, *and compelled*, to congregate and breed and rot in *dank cellars, stifling garrets*, or in those pestilential structures called tenement houses, where every particle of air is loaded with miasm; where sickening stench is ever present; where cleanliness and decency are as impossible as they were at the murderous prison-house called Andersonville; and where scrofula, and venereal disease, and typhoid fevers, and consumption are never absent; all of the people of the great city must partake, more or less, of the poisonous materials and demoralizing influences which emanate therefrom.

It is true that the "upper classes," who do not occupy houses in the immediate neighborhood of these "plague spots," suffer less than those who reside in close proximity to them. But they do suffer, nevertheless; and their diseases, sometimes terminating in death, are more frequently attributable to the malaria generated at places where rotting organic matters and animal excretions are accumulated, than is generally supposed. A current of air may, for days together, carry a stream of infection from these places to the splendid palaces of Fifth Avenue and Murray Hill, occasioning disease and death, and causing the favored inhabitants of those salubrious localities to wonder at the "mysterious Providence" that permits the "King of Terrors" to invade such out-of-the-way places!

It is just as clear, just as demonstrable, that all disease, all uncleanness, all miasms, infections and contagions that exist permanently in one part of the city affect all parts of it injuriously, as it is that smoking tobacco not only poisons the smoker but the atmosphere around.

It is the duty of government to protect persons and property; and it is the duty of municipalities to protect citizens from all local nuisances; and it is the duty of society (and its

own protection—the law of self-preservation—demands the performance of this duty) to protect every child which it compels or permits to reside within its proper jurisdiction, from all external influences which tend to vitiate its body and corrupt its mind.

I go still further. It is the moral duty of society to protect every child from obscenity and profanity. These are poisons to the mind as much as miasms are poisons to the body. What right has any one to use obscene language or utter profane oaths in the presence of my child, or his child, or any child? No one will pretend that he has or can have any right to mar, mutilate, deform or maim any one's child in the body. Why is he allowed to mar and deform its spiritual nature? A person who is profane or obscene in his daily walk or conversation is a moral leper in society. His touch is degradation; his breath is contamination. He should no more be allowed to associate with children than the animal with the "rinderpest" should be permitted to remain in the pasture with the rest of the herd.

The following extract from a lecture by the late noble champion of education and reform, Hon. HORACE MANN, may properly conclude this branch of our subject:

"I hold it to be morally impossible for God to have created, in the beginning, such men and women as we find the human race, in their physical condition, now to be. Examine the Book of Genesis, which contains the earliest annals of the human family. As is commonly supposed, it comprises the first twenty-three hundred and sixty-nine years of human history. With child-like simplicity this book describes the infancy of mankind. Unlike modern histories, it details the minutest circumstances of social and individual life. Indeed, it is rather a series of biographies than a history. The false delicacy of modern times did not forbid the mention of whatever was done or suffered. And yet, over all that expanse of time—for more than one-third part of the duration of the human race—not a single instance is recorded of a child born blind, or deaf, or dumb, or idiotic, or malformed in any way! During the whole period, not a single case of a natural death in infancy, or childhood, or early manhood, or even of middle manhood, is to be found.

The simple record is, 'and he died,' or he died 'in a good old age, and full of years,' or, he was 'old and full of days.' No epidemic, nor even endemic disease prevailed; showing that they died the natural death of healthy men, and not the unnatural death of distempered ones. Through all this time (except in the single case of JACOB, in his old age, and then only a day or two before his death), it does not appear that any man was ill, or that any old lady or young lady ever fainted. Bodily pain from disease is nowhere mentioned."

"Ill fares the land, to hastening ills a prey,
Where wealth accumulates and men decay."

BEAUTIFUL CHILDREN.—

"And shall the worm come forth, renewed in life
And clothed in beauty, and not man?"

"Beauty was lent to Nature as the type
Of heaven's unspeakable and holy joy;
Where all perfection makes the sum of bliss."

Every child that is born has the rightful inheritance of *perfect beauty*. This is implied in the phrase, "a sound organization." A perfectly sound organization is perfectly healthy, and a perfectly healthy person is perfectly beautiful. The conditions, therefore, for the propagation of beautiful children are very simple, so far as the theory is concerned. All that is required is good health and correct habits on the part of the parents.

Parents who are in comparatively good condition when they cohabit for reproduction, will frequently have children more beautiful than themselves; while, on the other hand, parents who are in their worst condition when they beget children are represented in the next generation by specimens of the *genus homo* more ill-looking than they are themselves. The rationale must be obvious, in the light of the principles we have heretofore considered.

Especially important is it for those who would have beautiful children to be in their best bodily and mental condition when the fruitful orgasm is experienced. A perfectly symmetrical body implies an equal and balanced, so to speak, contribution from every organ and structure; and to secure

this result, the person must be free from all local congestions or irritations. The stomach must not be loaded, the liver must not be obstructed, the lungs must not be congested, the skin must not be clogged, and the brain must not be oppressed. In short, there must be "the normal play of all the functions."

Nor is the place and its surroundings to be overlooked in this matter. It should be, in its furnishing and ornamentation, as pleasant as possible. Nothing disturbing or offensive or disagreeable should be permitted. "The influence of imagination," as the phrase is, has a powerful effect in molding the qualities and stamping the character of the offspring. A sudden shock, an extraordinary emotion, a strange sight, or a striking object, may, at the critical moment, modify for good or evil, some organ, function, faculty, propensity or structure of the new being for ever.

The late eccentric but talented LOLA MONTEZ delivered a lecture in this city a few years since on "Beautiful Women." She had traveled much. She had been received into the society of many of the royal families and nobility of Europe. She had made the personal acquaintance of Lady BLESSINGTON, the Empress EUGENIA, and other beauties of world-wide celebrity; and she had taken special pains to investigate the "Art of Beauty" as understood and practised by them. In every case she learned that the beauty practised the same recipe: Active exercise in the open air; tepid bathing once or twice a week; plain and simple food; with temperance and regularity in eating and drinking, and moderation in all sensual pleasures. In other words, they maintained good health by proper personal habits.

GOOD CHILDREN.—

"What is it, man, prevents thy God
From making thee his blest abode?
He says He loves thee, wills thee Heaven,
And for thy good has blessings given."

Every child that is born has the rightful inheritance of a

sound mind as well as a sound body. This means simply a healthy condition and normal quality of the brain-nervous tissue—the organ of the mind. Phrenologically, each distinct portion of the brain is a mental organ; and as the manifestations of mind will be according to the quality of the organ manifesting it, it follows that the moral and intellectual qualities of the child are as much dependent on physiological conditions as are its vital instincts.

However theologians may understand the doctrine of “total depravity,” no one in this enlightened age will deny that moral character and vital conditions have a close and inseparable relation. The most eminent and eloquent of modern clergymen do not hesitate to affirm that “good digestion is eminently promotive of all the Christian graces”—a principle not only physiologically orthodox, but susceptible of a very wide application. If any man or woman can be a good Christian with a wretched body and miserable health, he or she can be a better Christian with a comfortable body and excellent health. Many a person, too, who could be a very good Christian in comfortable circumstances and in the absence of temptation, might be a very wicked sinner under opposite circumstances and conditions. The practical method, therefore, of converting, reforming or improving the world—and I believe the theory is both physiological and Scriptural—is to place around it and before it the circumstances and conditions which influence it in the right direction.

While the child is in its mother's womb it is liable to be affected favorably or injuriously by all the causes which affect her in one way or the other. If she is disordered or defective in her vital functions—in digestion, respiration, circulation, excretion, etc. etc., its vital structures must suffer; and if she is disturbed in her mental functions—angered, grieved, depressed, etc.—its mental powers must be damaged.

Drunken husbands have begotten children when their brains were so deranged with the effects of intoxicating drink that congenital dementation has been the consequence

to the offspring. The precocious depravity and sensuality of many children, whose parents were "gluttonous persons or wine-bibbers," and the inherited fondness for liquor, tobacco and other abominations, whose fathers were besotted slaves to them, are sufficiently familiar illustrations of the law of the hereditary transmission of qualities. I have known several families in which the parents possessed good constitutions and enjoyed fair health, who were temperate and regular in their lives, and whose children, with the exception of the first-born, were quite as intelligent as the average of children. But the first-born was an idiot. Why? Because of the feasting and dissipations of the wedding occasion.

This extreme effect, however, rarely happens. But minor degrees of imbecility and innumerable forms of eccentricity are rather the rule than the exceptions. And I never witness a wedding at which the "happy pair" partake freely of the indigestible cake and the disordering wine that I do not pity the first-born, should pregnancy unfortunately occur within a few days.

After conception the father's condition or habits can have no further good or evil influence on the offspring during its embryonic life, except indirectly through the mother. The mother, however, may and must affect its character and destiny through all of her varying conditions during the whole period of gestation and lactation.

At the moment of impregnation both parties must, to some extent, transmit their qualities to the offspring; but either may transmit the lesser or the greater degree of their constitutional peculiarities, thus occasioning the greater or less resemblance to one or the other parent. But, from the moment of conception until birth, the influences of the mother are constant. During this period nothing can affect her injuriously that does not, to some extent, damage her child. Gross food may render it scrofulous; sedentary habits may cause its muscles to be weak and flabby; if she does not respire sufficiently, it will be puny and anæmic; if she is

drugged, it will be cachectic ; if she is mercurialized or anti-monialized, it will have a predisposition to tuberculosis and consumption ; if she is dosed with quinine, it will be defective in the external senses, especially hearing and seeing ; if she seasons her food highly, or partakes largely of grease and salt, it will be troubled with bilious humors and erysipelas ; if she takes the preparations of iron freely, its whole nervous system will be shattered ; if she employs opiates and alkalis for transient pains and sour stomach, its liver will be torpid and its bowels constipated ; and if she toils excessively and is kept in a condition of constant weariness, it will be unceuth, or at least imperfect, or unbalanced and unsymmetrical in form, feature and expression.

So too with mental influences. A fit of passion, a frightful narrative, a terrible sight, a grievous misfortune, an unhappy home, an unkind husband, a suffering child to care for, etc. etc., are each and all causes of abnormal conditions on the part of the mother, and consequent deterioration on the part of the child.

The rule, then, for the production of good children is exceedingly simple. *Keep the mother happy and comfortable.* The rule extends through the entire period of gestation and lactation, and it may be extended as much beyond as "whom it may concern" may please, and "the world will be the better for it."

It often happens that, in a large family of brothers and sisters there will be decided varieties and very great extremes of character. A good phrenologist can usually find sufficient diversity for an interesting and instructive examination of heads in almost any family of eight or ten children. Some will be precocious, others "behind the ago ;" one will be of the active or irritable temperament, another of the torpid or phlegmatic ; one will manifest a highly moral organization, another just the opposite ; one will be kind and confiding, another cruel and suspicious. Why these differences ? All have the same parents ; all have had the same care and edu-

eration ; all have been subjected to very nearly the same surrounding circumstances.

The explanation is not difficult. Their parents cohabited *just as it happened*, without rule or reason. They knew no law of sexual intercourse and observed none. Though wise on a thousand less important subjects, they were as ignorant of the physiology of the sexual relations and of the laws of reproduction as they were of the problem

“ Why Heaven has made us as we are.”

Sexual intercourse was practised according to inclination or convenience, with no regard to bodily or mental conditions. The question of offspring was left to chance, as the accidents or incidents, the blessings or afflictions of married life, ordained by a mysterious Providence or a more mysterious fate. And thus children were begotten in various conditions of vigor, and under different circumstances of unbalanced bodily and mental activity, and sometimes while laboring under actual disease. And the result is seen in the different bodily and mental endowments of the offspring.

The children of this generation are rapidly becoming wise on this subject. The teachings of the phrenologists and the Health Reformers have awakened a spirit of inquiry all over the civilized world, which is destined at no distant day to work the desired revolution. The risen and rising generations can not help their mal-inheritance. But they can observe the organic laws better than their parents have done, and so reverse the downward tendency of the race. Almost daily I read letters from young men and young women who are blaming (sometimes almost cursing) their parents, or rather the ignorance of their parents, because of the misfortune of an inherited frail, scrofulous, dyspeptic or consumptive constitution. They feel, and indeed they know, that they are stamped for life with an imperfect organization, and with morbid inclinations which they must for ever struggle against, because their parents have “ eaten sour grapes.”

Many an inquiring young person who "finds a law in his members warring against the law of his mind" blames his earthly parents. How can he help it? It was not his fault in being born. He had no part nor lot in the matter. And if those for whose interest, pleasure or profit, or by whose blunder he came into the world, have fastened imperfection and misery on his organization, why should he not complain?

WOMAN'S DRESS.—

"Give me a form, give me a face,
That lend simplicity a grace;
Robes loosely flowing, hair as free—
Such sweet neglect more taketh me
Than all the adulteries of art
That take mine eye, but not my heart."

Ameng the multitudinous causes which rob the child of its birthright of beauty and goodness this deserves special notice. If I were asked what *one* agency stands at the very head of morbid influences in causing frailty and malformation, I should answer, Woman's Dress. And if we can believe the current literature of the newspapers and magazines on this subject (to say nothing of the illustrations of the comic papers), such is the general opinion. Medical journals are generally emphatic in condemning it as abominable. Professor A. K. GARDNER, M. D., of the New York Medical College, declared in a late publication, in substance, that nothing could be better calculated to degrade woman mentally and destroy her bodily than the fashionable style of dress. That she has endured it for centuries and "still lives" is conclusive proof that "humanity is tough." That she will continue to be "woman as she is," or worse, and never can be "woman as she should be," while she wears it, every intelligent physiologist knows. What *man* would ever submit to be so trammelled with clothing that he could neither work nor play nor breathe without discomfort? True, there are certain creatures disporting the human form who distort their

features and deform their bodies and make themselves ridiculous generally, in order to exhibit to an admiring, or at least wondering crowd, some queer, strange, unseemly garment or article of clothing. But these are the exceptions, not the rule, and these persons are called fops or dandies, not men. With women, the one who dresses sensibly is the exception. But if vanity, perverted approbation, and waste of time and mind, were all the evils of the prevailing costume we had to deplore, there would be no occasion for introducing the subject into this work. But my plea for the generations yet unborn would be incomplete, and I fear all else that I can say would be well nigh useless, were I to neglect this matter.

The subject of woman's dress has another bearing which I will briefly indicate here. The fashionable mode of dress degrades and enslaves her. Its tendency is to render her frivolous and superficial. Instead of thinking and acting for herself, and having an opinion of her own as to what is useful and proper, and cultivating her self-reliance, independence and self-esteem, she only seeks to do as others do, regardless of all thought of right or wrong, to imitate the whims and caprices of her neighbors; she mistakes *a la mode* for beauty, regards *use* as a secondary principle of clothing, becomes morbidly sensitive to what "they say" of her, and loses her proper position in society.

I would not by any means intimate that *all* women whose dresses trail on the ground or side-walk are frivolous and foolish. Many are more sensible than they seem, and wear a dress which they have the good sense to abhor, because they have not the moral courage to adopt the better plan, or do not see that duty lies in that direction. But that the effect of the fashionable habit of dress tends to degrade the whole sex, and damage the whole human family, no argument is required to prove.

If the philosophy of the history of prostitution is ever written, good Christian women who are laboring so hard to reform the erring of their sex, and to send the Gospel to

heathen lands, will be appalled at the extent to which this vice is directly traceable to fashionable dress, and when they are told that most of the fashions are originated by this class of women, their admiration of its attractiveness may perchance decline a little. Can any one point to any thing in the fashion plates that is not addressed directly to the sensuality—the perverted or morbid amativeness—of the other sex? The low-dressed neck, the bare arms, the wide expanse of crinoline, the trailing skirt, the lace-edged petticoat, the fanciful shoe, and the fantastic bonnet—do they suggest, can they suggest, were they ever intended to suggest, any idea to a man except that the wearer is of the opposite sex?

I am of the opinion that if PROFESSOR ELLEN BEARD HARMAN, M. D. (who obtained the premium of one hundred dollars for the best plan of a dress for woman, at St. Anthony, Minn., in June last), could be exhibited *en costume* at the Universal Exposition in Paris in 1867, beside the most fashionably dressed lady that can be found in New York—we will not except Madame DEMOREST herself—the decision of nine-tenths of all the men present, and of *more than half* of the women, would be in favor of the “Reform Dress.”

But it is the effect of fashionable dress as regards the welfare of offspring that especially concerns us at present. If the fashionable dress injures the whole nature of the mother, the whole constitution of the child must suffer. That it does not do this no one will pretend. But its most serious injury is experienced at the most vital point. The mother, as we have seen, must breathe for her child during its embryonic life. It is on her respiration that it depends for oxygen or vital air. The fashionable dress diminishes her capacity to breathe; even when she is not laced so tightly around the chest as the fashion is, the heavy skirts, and their being supported around the hips, weaken the abdominal muscles, compress the viscera, depress the uterus and pelvic organs, interrupt locomotion, and thus indirectly render the respiratory function feeble and imperfect.

NÆVI MATERNI.—*Mother's marks, Mother's spots, Fancy marks, Moles, etc.*, which occasionally deform the skin of children at birth, can have no other origin or cause than the abnormal condition of the parents at the moment of impregnation of the mother during gestation. These spots are of various appearances; some are mere superficial stains, blotches or discolorations, while others are prominent, partaking of the nature of "aneurism by anastomosis," and consisting of an abnormal growth of blood vessels.

Some have denied the influence of the mother's imagination in producing these marks. But no fact in "disordered physiology" is better established. The phrase, "mother's imagination," however, is neither definite nor correct. A preternatural excitement of any mental organ or group of organs, or an extreme congestion of any vital organ may be sufficient to cause them. And the cause of these conditions may be a horrid dream consequent on an indigestible supper or a drug medicine administered for some trivial ailment.

MONSTROSITIES.—In the light of the premises we have explained, it is clear that all that is required to produce monstrosities instead of normal offspring, is an extreme degree or amount of the conditions which are the causes of ill-formed children, vicious children and *nævi materni*. If a married couple wish to produce a monster instead of a being "in the image of God," they have only to live as riotously and as abnormally as possible without disabling themselves for cohabitation. A surfeited stomach and a semi-narcotized brain, on the part of both, would almost assuredly beget an idiot.

Parents who have been drugged for a long time with the preparations of iron will be apt to have children predisposed to epilepsy and insanity. Those who have had a prolonged course of mercurial salivation, or have taken arsenic for a long time as a remedy for intermittent or skin diseases, will be in peculiar danger of having children manifesting such maladies as rickets, spina-bifida, club-feet, etc.

A monster is simply a perversion of organic development. A cancer, and all morbid growths which nosologists have designated "perverted nutrition," are essentially monstrosities of the part affected. Medical men have classified some eight or ten varieties. In some cases certain parts are deficient; in others certain organs are duplicated or coalesced. In some cases there are abnormal openings, and in others preternatural occlusions of canals or passages. In some cases certain organs are greatly disproportioned in size, and in others they are abnormal in position, etc.

DUNGLISON remarks:

"Among the numerous hypotheses entertained on the origin or cause of monsters, or of monstrosity, three only are worth mentioning. They have been attributed: 1. To the influence of the maternal imagination on the fœtus in utero; 2. To accidental changes, experienced by the fœtus at some period of its uterine existence; 3. To a primitive defect in the germs. The second seems to be the only one that is philosophical."

All anomalies of confirmation are reduced by some authors to three kinds: 1. Those with an excess of parts, as two trunks to one head, or two heads to one trunk; those with four arms and four legs; and twins united with a band, as the Siamese brothers, etc.; 2. Those in which parts are defective, as acephali; 3. Those in which there is an abnormal direction and situation of organs: for example, the heart being on the right side, the liver on the left, etc.

It is evident that in the cases where the important parts of the body, as the head, trunk or extremities, are duplicated or triplicated, two or more impregnated ovums must have united, the result of inflammation and partial disorganization.

The affection termed harelip, which is one of the most frequent monstrosities, is sometimes referred to in disproof of the theory that imagination, or the mother's mental state, has any thing to do with such abnormalities; and it is alleged, very truly too, that monstrous formations occur in animals, and even in plants, where imagination is out of the question.

The objection loses all its force when we apply the proper

language. It is not imagination, in the proper definition of the word, but *disordered* action of the mother's mental organs, in connection with deranged bodily functions, that occasions the mischief.

DUNGLISON says :

"Independently of all disturbing influences from the mother, the foetus is known to be frequently attacked with spontaneous diseases, as dropsy, ulceration, gangrene, cutaneous eruptions, etc. Some of these affections occasionally destroy it before birth. At other times, it is born with them ; and hence they are termed *connate* or *congenital*."

When medical men have a true theory of the nature of disease they will not thus darken counsel with meaningless technicalities. The idea of "spontaneous disease" can only mean disease without a parent or a cause—an absurdity. When we understand that disease is vital action in relation to an abnormal thing or condition—"remedial effort"—the subject is intelligible again.

INTERMARRIAGES.—Many statistics have been collected and published to show the effects on offspring of intermarriages, the marriage of cousins and other blood relations, breeding in-and-in, cross-breeding in domestic animals, etc. And, although the balance of statistical data is certainly against such marriages, yet this subject has two sides. But as this work is intended to teach philosophy and indicate principles rather than to collect facts and figures, I shall merely glance at their import. It is incontestibly true that men and animals have in some places deteriorated under a rigid and prolonged system of close intermarriages ; but it is equally true that, in other places, both men and animals have improved under the same system. It is also true that many children of those who have married first or second cousins have been born blind, deaf, imbecile, etc. But, on the other hand, the children of first cousins have been born "without spot or blemish," and have become, in due time, moral and intelligent men and women—far above the average mental capacity.

The fact that a greater proportion of the blind, deaf, dumb, lame, halt and demented of our almshouses and asylums are children of blood relations, proves nothing against the marriage of cousins. Nature knows nothing of majorities or minorities. With Nature all is law—absolute, invariable, irreversible, eternal. In a given community nine-tenths of the people may be addicted to grossly abnormal habits, while only one-tenth are living in accordance with the laws of life. And if any thing is to be decided by a promiscuous medley of statistics, collated indiscriminately, the chances are nine to one that it would be decided erroneously. If there is any reason why human beings should not intermarry, and why cousins should not marry, and why a brother should not marry his wife's sister, nor his own sister, and why a woman should not marry her own husband's brother, nor her own brother, etc. etc., that reason must be implanted in the constitution as a law of organic life.

The subject of prohibiting the marriages of cousins by statutory pains and penalties has been frequently agitated by the newspaper press; and our friends the phrenologists are prominent among those who condemn such marriages as improper under all circumstances, and even incestuous. I can not see the subject quite in that light; nor am I aware that they have ever advanced any argument in support of their position except statistics.

There are circumstances, in my opinion, in which the marriage of first cousins is perfectly proper and strictly physiological. And under some circumstances intermarriages, and breeding in-and-in would be better than cross-breeding, the least of two evils. And this brings us to the consideration of the law on the subject.

The object of life—"the chief end of man"—implies all the conditions which are to secure it. Whatever may be his final destiny, and whatever may be the reason for placing him on the earth, in the very nature of things the means for their accomplishment must exist—must inhere in the laws of

organization. To suppose that man is created for a purpose without the best possible provision being made to effect it, is to deny the goodness and ignore the intelligence of the Deity.

“To subdue the earth,” “to increase and multiply,” “to have dominion” over the animal creation, to be “lords” of the earth, and to “become as gods, knowing good and evil,” imply the highest possible development of all the powers of body and mind. They imply the preservation of the race; the transformation of the earth into homes, societies and institutions; the education of the intellect; the discipline of the propensities, and the final supremacy of the moral and affectuous nature. “God is love.” The end of all human existence is a condition of self and a state of society in which intelligent love, so to speak, shall be the ruling passion of all. “The lion” of selfishness and “the lamb” of benevolence will “lie down together,” and no one will pursue any calling nor desire any possession that is not consistent with the good of all.

In a word, the object of this life is *education*. Education means a recognition of our relations to other beings and to external objects. And as the universe is unbounded and its objects illimitable, the process of education may go on for ever. And thus we establish the principle of perpetual development—the law of progress.

To secure the highest moral and intellectual culture requires the best conditions of bodily organs—the mind’s instruments. And to secure the best conditions of both mind and body, human beings should be placed, sexually, in the most favorable circumstances.

Education being a process of development, and necessitating a constant succession of experiences, with continual observations from new stand-points, our desires being the propelling forces, our intellectual organs the guides, and evil and misery the correctives or “punishment,” it follows that good and evil, joy and sorrow, happiness and misery, as we obey or disobey the laws of our being, are equally useful, equally indispensable, equally beneficent, equally parts of the “eternal plan.”

And our happiness or misery, our enjoyment or suffering, is made to depend precisely on our obedience or disobedience to organic law. And our development, in body and in mind, is measured exactly by our conformity to physiological conditions, in all respects, as well as in the sexual relations. But in no respect are the evils of life—the pains, penalties or punishments—more prominently manifested, nor more terrible in their consequences, than when they are the result of disobedience to the laws of reproduction. For illustrations we need only refer to the miserable wrecks of humanity and the horrid train of diseases, which are the consequences of self-abuse and sexual impurity.

The best development of body results from the equal and harmonious cultivation of all the mental powers. They should be called out, exercised, in relation to the greatest possible variety of subjects or objects. And this requires variety of occupations, schools, the mechanic arts, agriculture, commerce, etc.

All mental powers, like all bodily organs which are not duly exercised, become feeble or perish; and if they are over-exercised they become disordered and prematurely decay. The best state of society is therefore that which affords the greatest variety of the means for occupation, for thought, for sensation, for education.

Persons whose acquaintance is limited to a small circle, who associate with few minds, and who reside in a district where nearly all pursue the same branch of business, and in nearly the same manner, are apt to become as monotonous and limited in their range of thought and reflection as are the circumstances around them. They may be good, steady, moral, industrious people, but they will be dull, “one-idead,” non-progressive. They may come to regard life (as do many of our well-to-do farmers of the rural districts) as consisting essentially of eating, working and sleeping, with special duties on Sundays to insure a passport to “mansions in the skies,” when the days of penal toil and “creature comforts” are

over. They are inordinately developed in the organs of amativeness, alimentiveness, and in all the self-relative region of the head; they are, perhaps, sharp and shrewd in the perceptive mind, but in the sphere of reason, and in the elements of a high spirituality, a profound statesmanship and a broad philanthropy, they may be exceedingly defective.

The majority of politicians are good representatives of this class of persons, and they, no doubt, are indebted to the influences we are considering for the kind and quality of their politics. They seek, first of all, their own aggrandizement; next, they regard the welfare of their own district, village or city; thirdly in order comes the good of their county or State; fourthly, the well-being of their nation; and lastly, the prosperity of the human family. "In the good time coming" this rule of action will be reversed. What good Christian does not take "CHRIST and Him crucified" as his theory? How few do not deny his practice!

From these considerations it is obvious that intermarriages, and especially among blood relations, are objectionable; because the more monotonous habits and occupations of the people tend to produce a general similarity in their excesses or defects of bodily organization. Long continued, therefore, the practice of close intermarriages must inevitably (as society is now constituted) tend to the deterioration of the race. And this is the physiological reason (whatever other reasons may exist) why marriages between brothers and sisters are still more improper than between cousins—why they are incestuous. Another objection may, I am aware, be urged against the marriage of brothers and sisters, and even cousins, when they are raised together in the same family. One of the worst evils in the world is the precocious development and abnormal direction of amativeness. It is wasting the vitality of the human race faster than any one cause that can be named. Children ought to be instructed in the sexual relations, in the uses of their sexual organs, as soon as they are old enough to understand the lesson. But if the thought

of marriage between brothers and sisters was admitted into the family circle, the effect could hardly be otherwise than an awaking of the sexual instinct sooner than Nature intended.

But very different would be the result of the marriages of blood relations, provided they were reared and educated as strangers. Circumstances can easily be imagined that would render a marriage of first cousins entirely unobjectionable; and it is equally obvious that marriages among those who are strangers, and have no recognizable degree of consanguinity this side of ADAM and EVE, may be highly improper. It is not where they are, but what they are, that makes marriage proper or improper.

But one extreme of public opinion is very apt to follow another. Within a few years much attention has been given to this subject, and quite a formidable array of statistics has been collated *in favor of intermarriages*. DR. BELL of this city, in an able article which was published in the *Boston Medical and Surgical Journal* for July 14, 1859, has shown that the statistics on which public opinion has been founded are incomplete and unreliable.

An interesting paper was read before the Historico-Genealogical Society of Boston, by Dr. C. F. WINSLOW of that city, in the fall of 1860, on the Character and Habits of the Hawaiian Race. Dr. WINSLOW, reasoning from the statistics alone, arrives at the conclusion that intermarriages are beneficial, so far as bodily and mental development are concerned, though wrong morally. He says:

“Society settles the moral point of the question, and the highest refinements of civilization are founded on its conclusions and should be maintained. But, so far as my own observation and study bear on the problem of defective organization in the offspring of close intermarriages, I am free to say that, as a purely scientific question, I consider it far from settled. On the contrary, I am led to believe that the ancient peculiar system of *tabus* overshadowing the entire polity of Hawaii, extending even to the training, food, methods of eating, exercise, mental action, religious belief, and to ideas of hereditary superiority, together with the strict observance of a fundamental, procreative, functional and

organic law, maintained from generation to generation, have tended to give unusual development, power, and physical and mental peculiarities to the high chief of this isolated group. Pride of lineage and lofty origin inspire the nervous powers of strong and intelligent men and women, who are not sensualists, with unusual vigor; and I see not why higher qualities of character and developments of form may not be transmitted from generation to generation in the human race by careful and systematic 'in-and-in breeding,' as well as in any other race of animals."

I think Dr. WINSLOW fails to see the important lesson to be derived from the data he has so well presented. It is not because of the in-and-in breeding that the Hawaiian nobility have acquired such an enviable development, but because they have so well regarded the conditions of health. It is Hygiene, not in-and-in breeding, that deserves the credit of their stalwart forms and high mental endowments. And if such great improvement can be made, despite the drawback of intermarriage, still greater improvement could be made without it.

Nor can I agree with the author in arraying a moral against a physiological law. If intermarriages are best scientifically they are best morally, whatever the "refinements of civilization" may say or may not say. But I apprehend that in this instance the science of the subject accords with the moral sense of civilization.

Fully to comprehend the bearing of the testimony before us, we must look a little further into the history of these singular people. Dr. WINSLOW remarks:

"It has always been known that power became hereditary on the female side. This is a historical fact familiar to the missionaries. Its explanation, however, is only now announced by my accidental meeting with that remarkable native sage in the lonely and beautiful valley of Kahakalooa. The highest female chief, or rather the nearest female to the royal ancestry and the divine head, has always been known to be equally or closely associated in the government. KAAHUMANU was as imperial in her abilities, character and power as ELIZABETH of England, CATHARINE of Russia, or ZENOBIA or CLEOPATRA of old, and may well be classed in force of character with this category of remarkable women. When I visited the islands in 1844, KIKAULOOH, the highest female

chief then living, was the successor of KAAHUMANU and KINAU (all widows of the renowned conqueror of the group, KAMEHAMEHA the First), and she was associated equally in the government with KAUKAULI or KAMEHAMEHA the Third, under the title of Premier. She was a woman of gigantic frame, and of imperial and dangerous will. Her husband, KENAINA, was a chief of high rank, but had no influence, except as a noble or large landholder. It has been reported of KIKAUUOHU, and is believed by many at the islands, who knew her character (although, in justice to her memory, I will say it is doubted by others), that she secretly caused the death of the only child that KAMEHAMEHA the Third had by KALAMA the Queen, who was a common native woman of great beauty, but wholly without rank or chief-blood. The death of this child was said to have been effected that her own offspring by KENAINA might come to the throne, and that no regal authority should become invested in an heir rendered illegitimate by the fact of not having descended from the highest female chief-blood. If she committed or instigated this crime, I should believe, from what I have learned of the binding effect of traditional law touching the descent and the source of inherent and sovereign power in the highest female blood, that she had less regard to the elevation of her own offspring to the throne, than to the preservation and purity of the royal stock, according to the traditions of her ancestors, as they descended from the gods. The present King, ALEXANDER, styled KAMEHAMEHA the Fourth, has married the daughter of the highest female chief, and associates his sister, VICTORIA, with him in the government, whose rank is higher than that of the Queen. Thus he follows the customs of his predecessors.

“The late King, KAMEHAMEHA the Third, had a sister named NAHE-NAENA. That she might be nurtured in the most Christian way, and knowing the influence which the lives and practices of the highest chiefs exerted on the common people, the Rev. WM. RICHARDS took her, when quite young, into his family at Lahaina, and brought her up with the utmost care until she was sixteen. After this, however, incest was practised between her and the King, her brother. To say that the King was a bad man at heart would be wrong, for I have never known a more generous-hearted man, nor a more considerate, benign or loving ruler over a confiding people, than he was over his humble kingdom. This act on the part of these important personages was unaccountable. The missionaries were startled at the failure of their prayers, apostolic teachings and spotless examples. The natives smiled or looked stolid at their sorrow and denunciations of the awful crime. The King and the royal sister were calm and indifferent, receiving the expostulations and discipline of their foreign teachers—the priests of a new and outwardly re-

spected faith—without resentment or explanation. No issue sprang from that connection. NAHIENAENA afterward married LILIHOKU, a high chief of the island of Hawaii. She died without issue, and was embalmed and entombed in the “royal mausoleum,” a very humble wooden structure, built on a little island in an artificial lake in Lahaina, not far from my residence. A thatched native house on this spot was the favorite residence of the King, above all other places in his domains. The mausoleum I have visited by the royal permission.

“The King had married KALAMA, a woman of no rank, and the only child to which she gave birth soon died. The King’s grief at the death of his sister was so great, that he has been known to often shut himself up with her remains for days together, with little or no food, having commanded his attendants to leave him undisturbed. This was the last of the royal line direct from the gods. Christian traditions had not uprooted the traditions of the Hawaiian elders. The sacred blood of the royal line was of more consequence to him and to his sister than the law and the prophets of another and a foreign faith. This, I have now no doubt, is the reason and the apology for the incest. What to us is a high crime, to that line of rulers was a compulsory and religious duty. It had been imposed on his ancestors by divine decree; and the high priests, from age to age, had forbidden its infraction. It became a foul crime in the presence of Christian civilization, but it takes more than ten years of apostolic culture to eradicate the traditions and Pagan superstitions of twenty centuries.

“The present King has been educated in the most enlightened manner, but I know, from his personal communications to me, that he is in possession of all the traditions of his ancestors, many of which, he informed me, were known only to himself and chiefs, and which, through all generations, had never been communicated to the common people. Thus the earliest superstitions have descended through an unknown lapse of time, with an inflexibility which has been broken in its observance only by the present King. He, however, still imbued with the genius of ancient institutions, associates his sister in the reserved rights of the crown, and thereby links the remotest traditions of rude, barbarous and absolute ages with constitutional forms and the refinements of representative government.

“There are two remarkable facts connected with the generation of the High Chiefs of Hawaii to which it may be interesting to allude, and which it may be appropriate here to record, inasmuch as I am not aware that either of them, any more than the one I have just stated, have before been given to the world. One of these facts concerns organic function; the other, organic structure; both, indeed, physiological, and

of much importance when applying laws which influence variation of species in plants and animals to the diversities of human form. They present a foundation, indeed, for the most profound morphological inquiry that has yet occupied scientific men—an inquiry which assumes an imposing magnitude, since this hard age of reason demands the calmest and closest investigation of all physical and moral causes tending to modify structural developments through successive generations among animals and men. Inasmuch as these facts are closely connected with the history and genealogy of the Hawaiian chiefs, they may be justly embraced among these 'Notices,' and in this connection, since the customs and personal habits of the high chiefs were dictated by the priesthood (which was also hereditary), the high priest always establishing or lifting *tabus*, and seeing that the commands of the gods were obeyed by the chiefs and common people.

"The first fact to which I shall allude is that it was the opinion of the chiefs that conception was only possible immediately after menstruation. There was always a separate house for their wives, in which they were to eat apart from the men, and one especially appropriated for those afflicted with periodical illness. Within eight and forty hours after these periods the chief cohabited with his wives. The offspring was always supposed to be legitimate from this circumstance; and, as great license existed, quarrels seldom rose in consequence of domestic dishonor.

"I have alluded to this curious and very delicate subject as a pure matter of history and genealogy; and coincident with this remarkable observation and systematic habit of a rude and unlettered people, I will call attention to the scientific fact, now believed very firmly by the most eminent physiologists, that conception in the human female takes place most frequently, if not always, immediately after menstruation.

"The second fact is the apparent difference of origin between the common natives of Hawaii and their chiefs. The *common natives* of the Sandwich Islands are by no means a well-formed or intelligent people. But the chiefs are always large, sometimes of commanding and enormous proportions and weight, of great intelligence and marked executive abilities. I was struck with this difference by my own observations, and had frequently heard this fact stated by the South Sea whalers who visited these islands for recruits as early as the year 1818. At that time, and for some years afterward, the high chiefs were numerous, and were reported to be, many of them, of enormous bulk, some of them weighing from two to four hundred pounds. In regard to the difference in size and appearance—physical characteristics, indeed, so remarkable as to attract general attention and remark, and as great as would among inferior animals constitute varieties in natural descriptions—there can be

ne question. How is this difference accounted for? Did these varieties spring from the same stock? In general character they seem identical. Distinctions in physical developments and intellectual and moral qualities are so remarkable as to be almost specific. This opens a question of great importance in a physiological view—that of the influence of close breeding, by domestic intermarriage, on offspring, and its effects on successive generations, whether disastrous or otherwise.”

To show the utter confusion in which mere statistics, without a physiological law to which they can be referred and by which they are to be interpreted, leave the subject, I subjoin an article (which is interesting for its facts) from the pen of Dr. HENRY BOYNTON of Woodstock, Vt. :

“Medical testimony has been against the doctrine involved in this subject, in its application to the human family. The annual reports from our institutions for the deaf, dumb and blind show that a large percentage of the pupils in these establishments are the children of parents who have married within degrees of close relationship, usually first and second cousins. Legislative enactments founded upon such observations have been earnestly and urgently called for in many States, which should make the marriage of cousins illegal, with the hope of reducing the number of children born with defective senses.

“Among stock breeders this subject has been one of almost endless discussion for years, but as yet no definite and reliable rules for the propagation of animals by breeding in-and-in have been established. Strong testimony can be adduced both for and against it. As a general thing we think the advocates of the practice have not examined the premises from which they have drawn their conclusions with sufficient accuracy and minuteness, and some of the sources from which affirmative arguments have been deduced are capable of furnishing equally strong negative testimony.

“Mr. KLIPPART, Secretary of the Ohio State Agricultural Society, who has been in Europe the past season, in a letter to the Commissioner of Agriculture, speaks of a visit he made to a Mr. STEIGER, in Saxony, and describes the condition of his flock of sheep. The flock, we are told, is ‘the most famous of all Saxony, if not of all Germany.’ This flock was founded in 1806, and has been bred in-and-in for sixty years, ‘and has had no infusion or admixture of any other blood.’ This certainly looks like a pretty good argument for this method of breeding, but it is to be regretted that Mr. KLIPPART has not given us the *number* of this flock, nor told us how *close* Mr. STEIGER’s method of breeding has been.

“A man may take a flock of one thousand ewes, to which he may put ten or fifteen rams, and he can breed them for many years without being necessarily compelled to resort to any very close in-breeding. Such may have been the plan followed by Mr. STEIGER. We would not call in question the correctness of Mr. KLIPPART's report as far as it goes, but it does not go far enough, and men who have small flocks of fifty or one hundred ewes should hesitate long before they commence this style of breeding on the strength of such statements as these Mr. KLIPPART has given us.

“The arguments which many advocate of the in-and-in breeding theory drawn from the habits of certain birds which are hatched in pairs, ‘as if for the express purpose of remaining together and inter-breeding,’ we think can have but little weight in this question, simply because we know but little about these so-called facts. We know that doves hatch their young in pairs, but we do not know that those pairs always remain together and inter-breed. On the contrary, who that has ever kept doves, does not know how often a stranger is taken into the family of the dove-cote? We are rather inclined to the opinion that where birds are hatched in pairs, it is only in accordance with the great law of Nature, that the sexes of all species shall be equally balanced, and not because the Creator designed that such pairs should remain together for the purposes of propagation.

“We are also told that wild horses inter-breed continually, brothers and sisters, parents and children, indiscriminately. Admit this may be a fact, who has ever had sufficient observation to say whether a given herd improves or deteriorates under such a practice? On the other hand, we are told by men who have spent their lives on the Western frontier that a stallion which leads an herd of mares will drive every one of his own fillics out of it.

“We read, too, that certain flock masters have practised this method of breeding in their flocks for years, with satisfactory success, and certain individual animals of admitted excellence are pointed out as the results of this practice; but who has ever told us of the number of decidedly inferior animals that made their appearance, in proportion to those of marked excellences? Now, is it a safe method of reasoning to infer that because you can occasionally get a splendid animal from parents of close relationship, that in-and-in breeding is *the* method by which alone the breeder can hope to bring his stock to the highest degree of perfection? Who has not seen fine animals from a cross of different branches of the same family? Why not claim that cross-breeding is the only road to success? The argument has just as much force in one case as in the other. The bull Hubback, the founder of the famous modern short-

horns, is said to have sprung from a common wayside cow. A strong argument, truly, for cross-breeding.

“We are told in an article on this subject in the *American Cyclopaedia*, that breeding ‘directly, sire to offspring, for two or three generations, though the latter is not desirable, is beneficial.’ Other experimenters say, ‘There comes a time when close in-and-in breeding between the artificial species which have been partly molded by man, produces less of vigor and degeneracy.’ The question naturally here arises, if breeding directly, sire to offspring, is beneficial for two or three generations, why is it not for three or more? And again, if in-and-in breeding is the readiest road to uniformity and perfection, why should we be warned of a time when this sure and ready road will bring us to ‘loss of vigor and degeneracy?’

“But we suspect the truth about this whole matter is, we have not *facts* enough to give us intelligent guidance. The man who only tells us of the few good animals he has produced, without telling us how many poor ones resulted from the experiment, has told us only half the truth, and that, according to the old adage, ‘half a truth is worse than a whole lie,’ is worth but little at best.

“But we have not introduced the subject here in order to give any opinion or to advance any theory of our own. We wish to call the attention of all intelligent stock breeders to this question, with the hope that all who have had any experience in this method of breeding will send us a detailed account of all the facts connected with their experiments. We wish to gather up as extensively as possible the experience of other men, with the view of finding in what direction the result will point. It is only in this way that we can ever hope to make any sure advance. We need a broad basis of *facts*, the broader the better, before we can deduce a rule for our guidance in the business of stock breeding, and every man who can contribute the mite of his personal experience, will be conferring a general good upon his fellow-workers in the same cause. Let no man refuse to write to us under the plea that ‘he never writes for the papers.’ We don’t ask for articles for publication; what we want is your experience plainly told. We care but little in what language your *facts* are clothed. The gold of Idaho is worth just as much before it goes to the mint as when it comes out in beautifully shining, finely-lettered, half eagles.”

TEMPERAMENTS.—Phrenologists teach that temperaments which are extremely alike, or extremely unlike, are not the best adapted for the conjugal relation. There is a foundation

for this doctrine. It is a "fiction founded on fact." The rule, which is a good one in a general sense for practical purposes, is based on the abnormal conditions rather than on the normal. The great masses of the human family are unbalanced both in their mental and vital organizations. Their organs and powers are disproportionately developed—excessively in some directions, defectively in others. Hence, the doctrine of Temperaments, which implies unbalanced organization. A temperament is a predominance of some one of the primary tissues or of certain organs. A predominance of the cerebro-spinal nervous tissue, with its accompanying large brain, constitute the *nervous* or active temperament; a predominance of the muscular tissue, with its sinewy limbs, constitutes the *motive* or strong temperament; and a predominance of the organic nervous tissue, with its corresponding digestive viscera, constitutes the *vital* or enduring temperament.

Phrenologists often mark off the relations and proportions of several temperaments in the same individual. They mean organs or structures. One person can have but one temperament, and a "balanced temperament" is just no temperament at all.

When the brain-nervous tissue and the muscular are both in excess of the digestive organs, the individual may be said to have the *active* temperament; and when the muscular and the organic-nervous tissue are disproportionate to the brain, the temperament may be properly termed *torpid*. Various modifications of organization have received the name of temperament; for example: A disproportionate development of the lungs and arteries, the *sanguine* temperament; of the liver and veins, the *bilious*; of the glands and absorbents, the *lymphatic*; of the bony structure, the *osseous*, etc.

I am of the opinion that a marriageable man and woman, each of whom possessed a perfectly balanced development of all the organs and structures of mind and body, would be perfectly adapted to each other, in the relation of husband

and wife, so far as temperament, or rather no temperament, is concerned. I admit that excessive goodness *might* be an evil, but I deny that there can be such a thing as "too good." Yet, from the considerations we have discussed in the preceding pages under the head of Intermarriages, it is obvious that, as nearly all persons are more or less unbalanced, it would be unfortunate for the offspring, and a cause of the degeneracy of the race, if both parents were unbalanced alike. Hence, the excess of one tends to correct the defect of the other, as we see illustrated in the case of tall and short persons, who, fortunately for the race, seem to be as much disposed to "fall in line" with each other as do those of average height.

So, too, the father might transmit to the offspring a good inheritance of brain, while the mother contributed most to the vital structures, or *vice versa*; or the mother might contribute most to the affectional organs and the father most to the intellectual, or *vice versa*, and in this way prevent the race from running to giants or dwarfs, or to moral or intellectual monstrosities.

Dr. W. BYRD POWELL of Kentucky published a work, a few years ago, on the "Human Temperaments," in which he advanced doctrines which I consider both absurd and mischievous. He classifies the temperaments (without telling us what a temperament is) into needless divisions and subdivisions, and further complicates the subject by informing us that the best organizations for the individuals is the worst for the race. He regards it as "physiologically incestuous" for the best temperaments to join in wedlock, and thinks that nearly all the evils of life are owing to such unphysiological marriages. His system is simply one-ideaism run mad! He defines the sanguine temperament to be "the best adjustment of all the parts;" but if a man and a woman marry each other, each of whom possesses the "best adjustment," they will either be sterile, or the children a very bad adjustment of parts. And he gravely informs us that WASHINGTON died childless because himself and the widow CUSTIS,

whom he married, were both of the sanguine temperament! Of course, all persons will be in danger of committing a grievously unpardonable sin, and securing to themselves domestic misery, if they marry without consulting the Professor or some one of his disciples, who I believe are not very numerous!

In an article published in Dr. DIXON'S *Scalpel*, Dr. POWELL refers the birth of sickly children almost, if not wholly, to similarity of temperaments, neglecting entirely a hundred causes of much more importance. I know husbands and wives whose temperaments are as "alike as two peas," whose children are neither sickly nor deformed, but, on the contrary, are among the very best specimens of juvenile humanity.

Says Dr. POWELL: "If a man of dark complexion, robust constitution and bilious temperament be united to a female of similar peculiarities, their offspring will neither be healthy, intellectual nor beautiful." How a "robust constitution" can be a damaging peculiarity in both I am unable to comprehend, and I think it would trouble the Professor of Temperamentology to explain.

It is, however, a satisfaction to know that all persons who are of suitable age, of good moral character, fair intellectual attainments, without extremely defective or excessive developments of any kind, in excellent health and of Hygienic habits, would do well to marry. And let others do better who can!

MISCEGENATION.—Much absurd twaddle has been published in the newspapers on this subject since President LINCOLN issued his Emancipation Proclamation as a military necessity. The Abolitionists were accused of a disposition to amalgamate the white and black races by intermarriages; politicians were greatly exercised upon the effect of such a comminglement of reproductive elements, and ethnologists labored assiduously to prove that something dreadful was almost inevitable. The

following article from the *Congregationalist* is therefore worth publishing in this connection :

“THE SOCIAL PROBLEM SOLVED.—Oberlin claims to have solved the great problem of the times—What is to be done with the colored people? For a whole generation they have enjoyed equal rights and privileges in all departments of that institution. About one-twentieth of the graduates have been colored. They have, without offense, sat side by side with whites in the classes, the lecture rooms and the public assemblies. The teachers assure me that they have found no difference in abilities indicated by complexion. Many of the oppressed race have found a refuge in the place. They labor at all employments with the whites—are blacksmiths, masons, carpenters and business men. There is a colored lawyer in Oberlin, an able man in his profession, who is perhaps oftener consulted by whites than any other lawyer. A colored blacksmith has educated five of his children, supporting them all through college by his own labors at the anvil. One of the lady graduates this year from the college is a mulatto, born a slave, and has been employed part of the time teaching in the preparatory department, and has proved herself one of the most capable and popular of teachers.

“A load of forty-nine freed slaves from one plantation in North Carolina was at one time left there—almost dumped down in the street, and left with but little money to take care of themselves. They did it so easily and noiselessly that many of the citizens never knew of their coming.

“And now, as to the social result. For this whole generation of practical equality there never has been any collision on the one hand, nor on the other a single case of intermarriage between the races. Some parties that had previously lived together as husband and wife at the South have formally acknowledged the relation after coming to Oberlin; but no such marriages have originated there. White and colored young men, and white and colored young women, are often seen walking together in the streets; but never white gentlemen and colored ladies or colored gentlemen and white ladies. Practical equality has not promoted miscegenation, nor any other evil. The nation may hence ‘take heart and banish fear,’ and give the colored man his rights.”

How great must be the diversity of species in the human race to render procreation impossible is an interesting question, as bearing upon the prevalent opinions respecting the origin and unity of the human race. That sexual intercourse between the African and Indian, and between either of these

and the Caucasian, is equally as prolific as is that between nations of the same race, is sufficiently obvious. It has been asserted that the union of the *extremely black* of the black race and the fair-haired, blue-eyed European could produce only hybrids. But I am not aware of any well-authenticated facts in point. The union of the male and female of different species of animals produces mongrels which are seldom fertile; for example, the mule, which is the offspring of the ass and the mare.

DUNGLISON gives the following table to represent the proportion of white and black blood in different admixtures :

PARENTS.	OFFSPRING.	DEGREES OF MIXTURE.	
		White.	Black.
Negro and white, White and mulatto,	mulatto, terceron,	one-half, three-quarters,	one-half. one-quarter.
Negro and mulatto,	{ griffo, griff, zam- bo or black ter- ceron, }	one-quarter,	three-quarters.
White and terceron,	{ quarteron, quad- roon, }	seven-eighths,	one-eighth.
Negro and terceron,	{ black quarteron or quadroon, }	one-eighth,	seven-eighths.
White and quarteron, Negro and quarteron,	quinteron, black quinteron,	fifteen-sixteenths, one-sixteenth,	one-sixteenth. fifteen-sixteenths.

The following table by TSCHUDI exhibits the per centage of the different varieties of half-castes and their proper designations :

White father and negro mother,	mulatto.
White father and Indian mother,	mestizo.
Indian father and negro mother,	Chino.
White father and mulatto mother,	cuarteron.
White father and mestiza mother,	{ creole (only distinguished from the white by a pale brownish complexion).
White father and China mother,	Chino-blanco
White father and cuarterona mother,	quintero.
White father and quintera mother,	white.
Negro father and mulatto mother,	zambo-negro.
Negro father and mestiza mother,	mulatto-oseuro.
Negro father and China mother,	zambo-Chino.
Negro father and zamba mother,	zambo-negro (perfectly black).
Negro father and cuarterona or quintera mother,	{ mulatto (rather dark).
Indian father and mulatto mother,	Chino-oseuro.
Indian father and mestiza mother,	mestizo-claro (frequently very beautiful).
Indian father and China mother,	Chino-cholo.
Indian father and zamba mother,	zambo-claro.
Indian father and China-chola mother,	Indian (with short frizzly hair).
Indian father and cuarterona or quintera mother,	{ mestizo (rather brown).
Mulatto father and zamba mother,	zambo (a miserable race).
Mulatto father and mestiza mother,	Chino (of rather clear complexion).
Mulatto father and China mother,	Chino (rather dark).

CHAPTER XVI.

PHILOSOPHY OF MARRIAGE,

THE CONJUGAL RELATION.—

“Did I drop against his breast,
Or did his arms constrain me? Were my cheeks
Hot, overflowed, with my tears or his?
And which of our two large explosive hearts
So shook me? That I know not. There were words
That broke in utterance—melted in the fire;
Embrace that was convulsion; then a kiss
As long and silent as the eestatie night,
And deep, deep, shuddering breaths, which meant beyond
Whatever could be told by word or kiss.”

—MRS. BROWNING.

IN the married relation, as in social and political relations, a miseducated world has got in the way of thinking, feeling and acting as though Love itself was “correlative” with its opposite, Hate! as though there was but just so much love in the world, of which one individual could only possess a determinate amount, and that if he loved his partner for life supremely, he must, *correlatively*, love God or his fellow-beings or both less. But this is a false philosophy, whether applied to domestic, social, political or religious life. Love is as illimitable as the universe. In its human manifestation it is an exercise of the mind. The exercise or action of any organ of the affectuous mind is its love. Exercise develops the organs; hence, the more one exercises a given organ of the affectuous mind the more love he will impart, and yet, paradoxical as it may seem, the more he will possess.

In the sacred and enduring relation of husband and wife the parties should love each other to the full extent of their capacity to love. Yet this does not imply that they should love any other human being less. And I am of the opinion that the more the moral elements are developed in human beings the more they will love all human beings, and wives and husbands, also, if they have them, and the more, also, they will love the God who made them all.

A single glance at the state of society in any part of the world can not fail to suggest to the thoughtful mind that the vast majority of families are acting on the principle that affection should be limited; that one's own wife, husband or child is entitled to all the care, love and consideration one person can bestow, so far as family relations and duties are concerned. Hence, a majority of our fellow-beings, good, moral, conscientious, perhaps religious, and of the highest respectability, are kind and indulgent and generous to their own household, but cruel, unfeeling and often unjust to the members of other households. How many Christian parents in the land, who have never known want, could endure the spectacle of one of their children begging in the street for bread? How many can treat the beggar boy of a poor neighbor as though he were a dog or a stone?

I recognize the full force of the adage: "He that provideth not for his own household is worse than an infidel." But I contend that one can do this as well and even better if he recognizes the principle that every needy child within the circle of his acquaintance has a claim on him also. The "sickly sentimentality" of the sensation novelists, who make their denaturalized heroes and heroines all in all to each other, and to live only and for each other, is all very well properly understood. They can not be too closely allied in heart; their natures can not be too much interblendod. But this does not imply that they should seek the happiness of their own family at the expense of the happiness of any other family or any other person. But because this is done so very generally the

great masses of human society are in a state of antagonism and selfishness instead of brotherhood and benevolence.

Says Dr. ALCOTT :

“It is affecting to behold—for the scene has occasionally been witnessed—a true family; one established and conducted on the Divine basis. No one seeks his own to the exclusion of another’s good; but, on the contrary, in lowliness of mind, each esteems the others better than himself. Is there a privation to be undergone? Each prefers to bear the burden, if, by so doing, the rest can be excused or exempted. Is a favor to be received of such a nature that it can be accepted or *enjoyed* by one person only? Every true brother prefers that another should receive it rather than himself. The amount is this: they love one another, and, so far as it goes, they are based on the Gospel or Christian plan.”

The above is a beautiful portraiture of a family as it should be. Such a truly Christian love pervading the family must insure a great amount of happiness, and if it could be so extended as to bring families in the same Christian relation with each other that the members of one family are, society would very soon be

“Redeemed, regenerated, disenthralled.”

“There is no school like the family school.” But if society would deal with its members as true Christian families do with their members, society would be a better school than the family.

UNION FOR LIFE.—

Are we not one? Are we not joined by Heaven—
Each interwoven with each other’s fate?
Are we not mixed like streams of meeting rivers,
Whose blended waters are no more distinguished,
But roll into the sea, one common flood?

I can not agree with the phrenologists that there is or should be in the brain a special organ appropriated to the function of “Union for Life.” The group of domestic pro-

propensities, Amativeness, Parentiveness, Inhabitiveness and Adhesiveness, which impel to the sexual embrace, to the desire for children, to the love of home and to permanency of attachment, seem to me to embrace all that is desirable or possible in relation to married life. A special organ to energize any one or all of them, or to associate them, or to superintend or regulate them, is no more needed and no more provided than are special organs to control other propensities. I am aware that it is generally held by phrenologists, by all so far as I know, that Destructiveness and Combativeness are executive or energizing powers to the other mental organs. But I see nothing in nature to prove this theory. On the contrary, I can see abundant evidence to disprove it. Each organ is its own energizer; each derives its power from the same nutrient source; each is related constitutionally to a certain object or range of objects, and each acts according to its own inherent energy. Every propensity and every faculty has its own executor, its own will, its own memory, its own "concentrativeness." Each is complete in itself, though two or more may associate or co-operate in one direction, and thus energize each other in the same sense that two or more persons would act in one direction with more power and effect than one would singly. So far from Combativeness or Destructiveness energizing Benevolence or Veneration, when all of these organs are simultaneously called into action, each to some extent antagonizes and counteracts the other.

Sexual Union for Life is suggested by Amativeness, it is intensified by Parentiveness, it is fixed by Inhabitiveness, and it is cemented by Adhesiveness. Those married couples who are never happy long when together, and always miserable when apart, may look for the solution of their difficulties in quite another direction than an unfortunate feebleness of development in an organ of "Union for Life." In most cases it may be found in morbid bodily conditions. In many cases the fault is in the inharmony or the misuse of any one or more of the domestic or social organs.

COURTSHIP.—

If you would have the nuptial union last,
Let judgment be the band which ties it fast.

Courting, as usually conducted in what is called good society, is all wrong. It places both parties in false and abnormal relations. It renders an actual acquaintance with each other's inmost thoughts, feelings, aspirations and inclinations difficult, if not impossible. I can hardly compare it to any thing better than a method of jockeying, in which each is trying to get the best bargain possible. The young man who is regarded as eligible, and the young lady who is considered of marriageable age, always put on their good clothes and best manners in each other's presence, whatever may be their clothing or conduct at other times. They seldom, often never, see each other as they really are. Interviews must be formally announced, and certain preparations made for them, so that no one shall be seen without the customary disguise. And then, to complicate the confusion, the young lady is taught not only to act a theatrical part, but to act *falsely*, to lie and deceive. She is taught that men are to make all the advances; that it would be immodest in her to intimate a preference until the question is "popped," when she has the privilege of saying "yes" or "no;" that it is indelicate in her to express a desire to get married; that for her to do any part of the courting is unfeminine, while for her to ask a man to marry her would be "perfectly shocking!" But no sound reason has ever been assigned why courting was not as much the privilege and the duty of a woman as of a man, and no good reason ever will be assigned.

There are many reasons why a woman has an equal right with man to court a companion for life, one of which is, because she is as much a human being as he is. And there are some reasons why courting is more peculiarly her proper "sphere," one of which is the function of maternity. As a general rule, women could, if allowed by social usages, select

suitable husbands better than men can select suitable wives. "It takes a woman to know a woman," is an adage which has been regarded as decidedly feminine, and if we should add, "It takes a woman to know a man," in view of prospective matrimony, the adage would be truer than if reversed.

It is very true that accomplished young women sometimes marry very strange specimens of the opposite sex, men who seem to disinterested spectators as uncongenial as January and June. But what else could they do? They had been taught that marriage was a necessity; that position or wealth was of first importance, and that although their heart could easily select a love-companion, they must limit their chance to marry to those of the privileged sex who chose to propose. This can only lead to management and maneuvering, and hence strategy is as common in the pursuit of husbands under difficulties as it is in the trade of war or politics. Says an admirable author:

"Wealth, rank, beauty and accomplishments are not of course to be despised—they have their value. But how contemptible is it that many, not to say most, of our best Christian families never give the young any other instruction with regard to courtship and marriage than what may be gathered from a few desultory conversations about these mere externals? What one party or the other has gained, or is likely to gain, of personal beauty or pecuniary advantages, will be far more likely to elicit attention in almost any social circle, either within the family pale or beyond it, than the more important inquiry whether the parties, by their union, have, either of them, increased their means of usefulness. Who does not know what is meant—and how much—by the practical and, I had almost said, only question ever asked in these cases, viz.: Has she married *well*? are they *pleasantly situated*?"

A truly mated couple in a hovel have no reason to envy a couple who are "married but not mated" in a palace.

One of our great mistakes is in separating the sexes in their plays, avocations and schools. Boys and girls should mingle freely and familiarly (of course, under the direction and supervision of parents and guardians) in the house, in the field, in the workshop, in the school and in the church.

The influence and association of each refines, energizes and ennobles the other. They would then learn to be free and frank, each would have an intimate acquaintance with all the other's feelings, and courting would not be done in the dark, on the sly, nor by proxy.

CHOOSING A WIFE.—

Enough of beauty to secure affection ;
 Enough of sprightliness to cure dejection ,
 Of modest diffidence to claim protection ;
 A docile mind, subservient to correction,
 Yet stored with sense, with reason and reflection,
 And every passion held in due subjection—
 Just faults enough to keep her from perfection.
 When such I find, I'll make her my election.

For the sake of the offspring and the race, it is vastly more important that the mother should possess a vigorous bodily constitution than the father, provided one or the other must be frail. And the young man has only to examine the statue of the Venus de Medici, or POWER'S Greek Slave, or his statue of Eve, to learn the outlines of a good vital organization. In these admirable sculptures he will see the *normal* female form. And he has only to look at any of the fashion plates in DEMOREST, GODEY, LESLIE or other "magazines for ladies," to see the "frightful example" of deformity—an abnormal shape, which can not possibly enjoy health or possess strength, and which is not fit to be wife or mother.

It is not necessary that every woman, to be a proper candidate for matrimony, should possess the precise features, nor the exact form, nor the full size, nor the balanced organism of the Venus de Medici, to be a suitable companion physiologically and mentally. She may be taller or shorter, fuller or more slender, blonde or brunette, etc., but she must not be contracted around the lower portion of the chest; she must not be "wasp-waisted," concave and "caved in," where she should be round, full, convex. Such a woman can not half

breathe. She can neither feel, think nor act normally. She can not love, she can not judge, she can not do as a healthy woman would. Nor is it possible for a man to love her in return, however tenderly and kindly he may treat her, as he could and would one who could gratify not only one, nor several, but all of his mental powers.

The celebrated German physician, HUFELAND, gives, among various rules for marriage, the following: "A person should not marry unless into a family remarkable for longevity. Women of a nervous temperament, those who are very irritable, nervous, hysterical, subject to convulsions or epilepsy, ought to avoid matrimony."

Such saving rules might have been very tolerable in the days of METHUSALEM and his immediate descendants, but if rigidly applied in these days and in this country, I fear the problem of populating the Great West and the reconstructed South with native Americans will have to be deferred for a few generations, and until the Health Reformers can renovate the race.

CHOOSING A HUSBAND.—

Of beauty, just enough to bear inspection;
 Of candor, sense and wit, a good collection;
 Enough of love for one who needs protection,
 To scorn the words: "I'll keep her in subjection;"
 Wisdom to keep him right in each direction,
 Nor claim a weaker vessel's imperfection.
 Should I e'er meet with such in my connection,
 Let him propose, I'll offer no objection.

Men are more prone to selfishness and dissipation than women, while women are generally more frail and feeble than men. In selecting a husband, therefore, she must more especially examine into his personal habits. In the early days of the Temperance Reformation, "Teetotalers or no husbands" became a maxim with the Washingtonian young ladies and the Sisters and Daughters of Temperance (which, I am sorry

to say, all of them did not abide by); and a very pertinent retort was, "Natural waists or no wives" (which, I regret to have to record, was not always persevered in to the end). Every woman who marries a man who is addicted to the use of intoxicating drink ever so moderately, runs the risk of eventually finding herself yoked to a drunkard instead of married to a man. But there is a worse and more prevalent habit among the young men than liquor-drinking. I mean tobacco-using. To say nothing of the filthiness and indecency of the habit, it is undermining the constitutions and exhausting the vitality of the young of our country at a fearful and a rapidly increasing rate. Because it does not occasion acts of violence, assaults, murders, etc., its injurious consequences are generally supposed to be less than those of alcohol. But while alcohol excites the muscular system, tobacco torpifies the brain and nervous system, depresses all the vital energies, paralyzes the organic instincts, and lowers the tone of the whole moral nature. The breath of a tobacco user is always nauseous; all the exhalations from his body are pestilential. No woman can sleep in the same room with him, much less in the same bed, without being poisoned with the emanations from his breath and skin, and no child can be born unto him without a more or less depraved organization.

I have known several young ladies to refuse offers of marriage from persons who, had they been free of this disgusting habit, would have been accepted at once. The more simple the habits of young ladies, and the more developed they are in the respiratory system, the more keen are their organic instincts, and the more offensive is the smell of a man who uses tobacco. Many women have consulted me professionally whose "nervousness," and "sinking spells," and "vertigoes," and "heart-flutterings," and "rushes of blood to the head," were attributable solely to the tobacco which their husbands chewed and smoked.

A young lady of rare personal accomplishments, and of a figure that would have served as a model for the *physical*

“woman as she should be,” was my patient a few years since. She was of a sanguine temperament, round and full in the region of the vital organs, and of course correspondingly acute in the senses of smell and taste. She could not endure tobacco nor the person who used it. She had refused two opportunities to marry, the only objection in each case being “the filthy weed.” She declared she would always live single and *clean*, rather than embrace the horrible stench of a man saturated with the narcotic abomination. She is now married, and to a worthy man who does not, never did and never will use tobacco.

WOMAN'S SUPERIORITY.—

The mother, in her office, holds the key
Of the soul, and she it is who stamps the coin
Of character.

I have long advocated woman's equality, mental and physical, and her equal rights, domestic, social, civil, political and religious. I can not conceive of any right or privilege, as relates to the individual, to the family circle, to society or to government, which man claims for himself, that woman may not as justly claim for herself. Rights no more pertain to sex than they do to nation or race. They inhere in humanity. If woman is a human being and a fellow-citizen the question is settled in her favor. If she is not, what is she? If there are any laws which appropriate her to man they are man-made and not God-given. Human statutes do not always “re-enact” the “higher law.” - Because in marriage the “twain become one flesh,” it no more follows that the woman is to lose her individuality in society, and her inherent rights before the law, than that man should lose his. They are, indeed, one in heart, mind, life, purpose, but two persons nevertheless.

But the late Mrs. FARNHAM, in her admirable book, “Woman and Her Era,” contends for the actual superiority of woman as the highest type of organization yet produced

on the earth. She claims that because woman has all the organs, or their analogues, that man has, and two (the uterus and mammæ) which he does not possess, she is organically and in function a superior being. She argues :

“Life is exalted in proportion to its organic and functional complexity. Woman’s organism is more complex and her vitality of function larger than that of any other being inhabiting our earth. Therefore her position in the scale of life is the most exalted, the sovereign one. She operates the elevation of her types and grades by the addition of parts not employed in the inferior types and grades.

“What is a grade of development? Evidently it is a difference of development, whatever else it may be or may not be. More, it is a difference of physiological quantity, the term, as has been said, more and less, higher and lower. Now, more means here, as we know, the expression of an added function or functions through the instrumentality of an added organ or organs. Let us then look at the human masculine and feminine by the light of these definitions.

“The broad kingdom of human life and organization is common to the masculine and feminine. In the functions and organs to which the preservation and welfare of the individual are intrusted their endowments are numerically balanced. Thus the nutritive function in each is compounded of an equal number of more special functions, and employs an equally elaborate apparatus of viscera, vessels and tissues of every sort. The respiratory and circulatory functions have the like balanced character and service; so also have those of secretion, exhalation, absorption and depuration. In all these respects the differences between masculine and feminine are differences of relative proportions, not of primary powers; of degrees of relative capacity, but never of kinds of capacity; man possessing all that woman does, some in greater, some in less measure; woman all that man does, with, of course, the like qualifications. Thus human anatomy and physiology can be studied from the masculine and feminine stand-point almost indifferently well, up to the limits of those functions and organs which serve and concern the individual supremely. The divergence is established where the function which clothes them with the most God-like of their powers, that of creators of their race, comes into the scale of endowments, and henceforward we must study each for the knowledge of its sex, and of the characteristic powers and responsibilities belonging to it.

“It is plain now, if we have discerned Nature’s purpose in the previous inquiries, that the sexes will prove to be grades of development

only by proving to be quantitatively different beyond the line of common development. There are the strictly masculine and feminine organs and functions in which, according to the nicest investigations which anatomy and physiology have yet made, they balance each other, part for part, in furnishing the elements for that union whose sublime result is to be an embedded, immortal, conscious life.

“When this union takes place, there is immediately required a fit place for the protection of those plastic elements; there are at once employed upon them functions which have no other employment in all the wide economy of life—powers which here, and here only, find their expression and use. It need not be said that this sacred repository, this unique, interior, separating organ, belongs to the feminine, with all the powers of every sort, capacities, susceptibilities, emotions that go with it, and make up its super-organic domain. Nor is this the place to offer more than a mere suggestion, a hint, of the expansion of the whole nature which its presence confers on the feminine. Say that the parts of each are balanced up to the moment when masculine and feminine surrender their respective tributes; say, if you please, that that of the masculine is the leading part, though there is not, in all the investigations that science has yet achieved, a jot or tittle of evidence to this effect, and somewhat, as we shall shortly see, looking to the opposite view; yet grant that it is foremost in importance up to this moment of conjunction, how different, henceforth, is the relation of each to the future being! How embracing, how close, how inseparable, how interfused is the one life; how detached, separated, excluded, removed the other; walking in its wide, devious ways on the earth; perhaps leaving it by death, unconscious even that the life-forces have appropriated any thing from it toward another being; always physiologically indifferent whether it be so or not, and capable of being emotionally and morally so likewise. To the masculine parentage is an incident; it may be much or nothing, according to the accidents, tendencies and development of the life. To the feminine it is being set apart by Nature to a sacred trust, which can be violated only at tremendous peril—peril to the moral and physical welfare both of itself and the coming life—peril proportioned to the awful magnitude of the responsibility, and to the divine influence it makes upon the nature; in whose innermost depths of soul and body a life is deposited to draw thence, by God’s edict, support, form, power, expression; to whom a soul is given to be individualized in some garb of flesh—a spirit to be started on the endless road of the eternities.

“And again, when this life has received thence what is its due (or what it can get), and comes forth into the world to take its place there, it is not yet superior to the relation of personal dependence on that

which has cherished and built it up thus far. Yet another function must serve it—another organ, of a fine, complicated, exquisitely sensitive mechanism, must be employed in its behalf. It must still live by the mother, scarcely less than in its ante-natal period. And hence her organic life is again enlarged by the addition of the mammary gland, a structure which is balanced by nothing in the anatomy of man, and her functional life by the capacity of lactation, a power to which there is no equivalent among the normal masculine capacities.”

Mrs. FARNHAM concedes the superiority of the masculine in the osseous and muscular tissues, so far as size is a measure of power; but she contends that the greater bulk of the male is counterbalanced by the finer organization and greater complexity of the feminine nervous tissue. Yet it may be fairly questioned whether the differences of the sexes in respect to both quantity and quality of muscular and nervous tissues, as well as the relative development of the mental and vital organs, are not wholly, or almost wholly, artificial. It is certain that, wherever the usual avocations of men and women are reversed, the differences diminish. And every where in civilized society we can see numerous specimens of “masculine women” and “feminine men.”

In an able article on the “Capacities of Women,” in the *Westminster Review* for October, 1865, the writer gives a historical item in point of immense significance:

“A traveler, recently returned from Africa, spoke at the first annual meeting of the Female Medical Society this summer a short speech, of which the following is the substance: ‘I am a medical man. I have spent several years in Africa, and have seen human nature among tribes whose habits are utterly unlike those of Europe. I had been accustomed to believe that the *muscular* system of women is necessarily feebler than that of men, and perhaps I might have dogmatized to that effect; but to my astonishment I found the African women to be as strong as our men. Not only did I see the proof of it in their work, and in the weights which they lifted, but on examining their arms I found them large and hard beyond all my previous experience. On the contrary, I saw the men of those tribes to be weak, their muscles small and flabby. Both facts are accounted for by the habits of the people. The men there are lazy in the extreme—all the hard work is done by the women.’”

One need only contrast the broad, round chests, the rosy cheeks and the hard, muscular arms of our "Bridgets," who are "maids of all work," with the narrow, concave chests, the pale, bilious cheeks, and the thin, skinny arms of many of their mistresses, for a sufficient illustration of the principle that exercise, and that only, can develop and sustain a vital organ or structure.

Very naturally, the author just quoted applies the principle he has established to the mental as well as the bodily powers of woman. He says:

"This experience has further led me to consider whether the *mental* inferiority which we ascribe to our women may not be due wholly to the habits of our nation, which do not allow to women the same mental exercise as men."

The following passages from the *Review* are worthy of permanent record:

"If it be a law of Nature that the average woman shall be smaller than the average man, then, with equal cultivation of strength, we presume that the average man will be the stronger. There *may* be a like relation of minds, but no such opinion, true or false, concerns our practical duties. It suffices for us just now to insist that no one has a right to treat as *abnormal* the powers and accomplishments of such women as HARRIET MARTINEAU, MRS. SOMERVILLE, and others of preceding times, who have been illustrious for mental capacity. The whole sex ought to have the credit of them in this sense: that they show what woman can attain when circumstances favor their cultivation. When we see one woman among us excel in a particular study or art, the natural and reasonable inference (which has a right to stand until disproved) is, that there is nothing in it which may not be counted on under similar conditions. No age, no country in Europe has been without women who, in powers and accomplishment, far surpassed average men, and their solid attainments have been greatest where society most opened a career to their talents. In the United States this fact is every five years more developing itself. We claim, therefore, that the talents and attainments of individual women shall not be idly set down as exceptional, or still more idly scoffed at as unfeminine, but shall be made an index to the powers of the sex in general.

“Miss BESSIE RAYNOR PARKES has met, we are sorry to say, with rudeness from anonymous male writers, who seem to imagine that she is bent on unsexing woman, or is unalive to the essential necessity of some feminine virtues. The small book before us, ‘Essays on Women’s Work,’ appears to us a model of good sound sense, and keeps eminently aloof from any extreme views. She does not fall into the error of her male assailants, who set up their own ideal of the world, instead of manfully accepting what they find and seeking to make the best of it. She refuses to shut her eyes to facts. She finds that machinery, free trade, competition, emigration of men and premature death of husbands, draw great numbers of women away from their homes. Domestic work being no longer profitable, they are doomed to work in factories. This (she says) is the great and, for women, often the terrible fact.”

MARRYING AND GIVING IN MARRIAGE.—

Teachers whose minds move faster than their age,
 And faster than society’s slow flight,
 Must bear the ribald railings and the rage
 Of those who lag behind.

MISS ANNA E. DICKINSON delivered a lecture in the large hall of the Cooper Institute, January 9, 1866, before an audience of three thousand persons. Her theme was “Home Thrusts; or, Marrying and Giving in Marriage.” She traced the history of the girls and boys of fashionable life from the cradle to adult age, and showed, in an ample number and variety of facts and anecdotes, presented in her best style of argumentation and appeal, the gross injustice done to what society is pleased to denominate “the weaker sex.” Boys are educated and trained for manhood, not husbandhood, while girls are educated and trained, not for womanhood, but *wifehood*. The young man is taught to cultivate all his powers of body and mind; to develop his whole being; to aspire to the highest positions in life; to be self-reliant; to be a man first, and a married man or not according to circumstances. The young girl is taught to acquire certain accomplishments, and to look to marriage as the sole end and aim of her existence. This difference in primary education, the eloquent speaker contended, was the chief cause of the inequality of

the sexes in mental and in physical capacity, and the reason why women are so generally more vain, frivolous and frail than men. On the important question of "Woman's Rights" she took the extremest ground; that is, she advocated woman's equal social, civil and political privileges, and her equal right to education and avocation.

All of these propositions have been as ably presented before in lectures and in books; but we are glad to know and to record that Miss DICKINSON is sound on the great fundamental problem in Sociology, because of her popularity as a speaker and her ability to command the attention of large audiences.

So long as parents teach their girls that "getting married" simply is the Alpha and Omega of their existence, they will be almost certain to acquire tastes, habits and manners which unfit them for wives or mothers. They will learn accomplishments, and yet be as ignorant of the duties and responsibilities of the matrimonial relation as the Chinese ladies, with their dwarfed feet, are ignorant of the proper method of walking.

How often do we read in the papers that some blooming young maiden of eighteen or twenty has married wealth and position, the condition being that she must acknowledge before the world that a certain superannuated old man or exhausted libertine is her lawful husband! And how very often is it the case that well-meaning young ladies (who have been so often told that, "if one does not accept the first offer, another chance to marry may never occur," that the admonition has become a part of themselves) marry the first fashionable fops or well-dressed rakes that insult humanity and blaspheme heaven by offering to marry at all!

Fathers often give their daughters to homes, not husbands. Better for their daughters and for society that they were forever homeless. Let both girls and boys be educated to know THEMSELVES, to take care of themselves, to understand business, and let all schools, all libraries, all reading-rooms, all

avocations, with equal wages for equal services, be alike open to both, and there will be no need of providing them with wives and husbands. "Marrying and giving in marriage" will soon become obsolete. They will all find congenial companions and marry, or, what is the next best thing, remain unmarried.

THE MARRIAGEABLE AGE.—

"By sweet experience know
That marriage, rightly understood,
Gives, to the prudent and the good,
A paradise below."

Physiologists are as discordant in their opinions concerning the proper age for marrying as they are with regard to almost every other problem that concerns the functions of human beings. Dr. JOHNSON, in his works on the Economy of Health, says that matrimony should not be contracted before the first year of the fourth septennial on the part of the lady, nor before the last year of the same in the case of the gentleman; in other words, the woman should be at least twenty-one years of age, and the male twenty-eight years. He thinks there should be a difference of several years between the sexes, at whatever period of life the connection is formed. Other writers, however, of equal celebrity, have regarded eighteen to twenty-one, on the part of the woman, and twenty-one to twenty-five, on the part of the man, as the preferable ages. ARISTOTLE opposed early marriages on the ground that, "in the entire animal kingdom, the fruits of the first signal of reproductive instinct are constantly imperfect." But this rule applies to *very early* marriages—marriages soon after puberty. MONTESQUIEU declares that marriages soon after puberty produce a diseased, puny and miserable population.

Quite as emphatic are the declarations of many eminent authors against late marriages. In some countries laws have been enacted against marriages when men were more than sixty and women more than fifty years of age.

Several late writers have taken ground against early marriages as one of the worst features of American society. That many of these so-called marriages are mere *fancy matches* is evident enough. And that thousands of the ragged and vicious children in our streets and poorhouses are the result of such marriages is equally obvious. There is too much truth in the following :

“ We are satisfied that the great majority of runaway marriages owe their origin to novel-reading. Silly girls peruse fictions of European life, and where parents really are cruel, and not perceiving how different American life is, persuade themselves that their father is a tyrant also. Often they go further, by falling in love, according to the orthodox fashion, with some lackadaisical dandy, ‘a love of a man,’ as nursery maids say, or with a whiskered *roue*, whom they profess to be able to reform, but whose vices make him all the more interesting, as they did BYRON’S heroes and BULWER’S ‘Paul Clifford.’ Others think it romantic in itself to run away. Their names, they tell themselves, will be in the papers; editors will pen congratulatory paragraphs, and ‘sympathizing hearts’ over thirty States will waft wishes for life-long happiness to the persecuted pair.”

It is clear, in the light of physiology, that both plants and animals must acquire perfect development before they can produce their young in the best condition or most vigorous and perfect state.

But, in the diversified habits of society, some persons mature at an earlier age than others. Many men, and not a few women, have exhausted a large share of their vitality in early life by self-abuse, the use of liquor, tobacco, etc.; so that some persons are, physiologically and sexually, as I have heretofore stated, as old at twenty, thirty or forty years of age as others are ten, twenty or thirty years later. Many persons marry who, from the causes above named, are so constitutionally frail that offspring, if born unto them at all, must inevitably be puny and miserable, and some of them will not have vitality enough to live through the period of childhood.

That the children begotten by parents in maturer life—from thirty to forty years of age—(other circumstances being equal) are more moral and intellectual than those begotten ten or fifteen years earlier (who are more passionate and selfish), is a proposition well sustained by statistics and logic. That early marriages do, however, in the disordered condition of society, often conduce to the health, welfare and longevity of the parties is unquestionable; and there is, at least, a fair show of argument in the following article which appeared in a late number of the *California Farmer*, in advocacy of *very early* marriages:

“It has been stated that woman should not marry until twenty-one and man at twenty-five. I believe it a wrong theory, for the reason that no human being can rule Nature’s actions, and also that each and every animated being alone experiences such actions. Nature, it seems to me, teaches us a natural time, irrespective of ages, when we see that in warm climates vegetation is so much more precocious than in Northern climes; in warm countries the trees will blossom much earlier, and consequently there will be earlier fructification.

“Who will deny that Nature exercises her sway alike on all animated beings? Assuredly not the physiologist. In Spain they marry at from thirteen to eighteen; in Southern France, the same; in Southern Italy, the same; in fact, in all the Eastern Hemisphere. In Northern climes they marry later (to this rule, however, I must make exceptions for family origin); it is not to be supposed that a Southern family migrating to a Northern clime will less impart their genealogy to their offspring—this will happen only to the second generation.

“Thus physiology teaches us that when a tree blossoms it is Nature requiring fructification, and *vice versa*. Now what must be done to stop this fructification? Either cut the tree or prune the blossoms, and how long will a tree stand such proceedings? Can we do this in all cases? What is the effect of a heavy frost on blossom trees? Has it ever been seen that the next fructification was either as large or luscious? In all my observations I have always found the contrary; I have often seen the same trees remain sterile, and this evil, sir, is a natural cause; how must it be, then, when we resort to artificial means to produce the same result? It has been demonstrated by actual experiment that such proceedings will speedily impair the vitality of the tree, and, if persisted in, the tree will die. It is well known, also, that one single abortion in

Nature, will produce more evil than twenty fructifications. And I will here ask, how much more evil is it to produce a total privation? And who can say that a young tree does not produce handsomer and more delicious fruit than the elder ones? I have seen young trees bearing fruit the third year, the magnificence of which immensely surpassed the fruit of the same species; also, why is it that grafting will fructify on one tree and remain barren on another? The study of genealogy will solve the mystery. Now, if I am correct in my study, where I find that all animated nature is ruled by the same law, do you not think as I do, that it is against the laws of God, taught to us by His creation, to resort to artificial means to postpone or annihilate her course of development, or to force one kind upon another? When we see Nature refusing to perform her work for want of genealogy, ought we not to know that the same laws, ruling alike on vegetable and animal being, her course ought not to be obstructed? How many have and do languish and die for the want of the application of these rules? We have daily proofs of the terrible effects of these causes; parents ought not to be ignorant of those laws as they must have experienced them themselves. Why then condemn a being to a wretched life or the grave for their unholy caprice?

“I hope the day is not far distant when those laws will be understood by all, and then will society regenerate, and mankind will no longer suffer from those dreadful diseases which at present degenerate our race, and which, if persisted in, will surely bring the destruction of mankind.

“When natural inclination shall be better studied and wealth shall no more be a bar to natural instincts, we shall no longer have to record so many victims to debauchery and crime, illegitimates and dumb mutes, rickety and scrofulous children, adulteries and infanticides; people shall live happy, and bring forth strong and healthy offspring, and instead of our lives averaging from twenty-three to thirty-two years, as they now do, people will live as of old, averaging from sixty to seventy-five years. Show me a man who will have preserved a youthful appearance who married after twenty-five years of age; they invariably look at the age of forty or forty-five as a man should only at sixty. Now, look at the man or woman who married before twenty, and you will find them at the age of fifty with their family grown up, and they with a physiognomy as florid as the others at thirty. These attestations of Nature are conclusive.”

I fear the writer has mistaken *precocious* for “natural” inclination. I can not doubt that if all persons would live in all respects normally for a few generations their “natural inclinations” would be an infallible guide.

My advice to all who desire to enter the matrimonial relation is, in view of all that has been written and taught on the subject, never to marry until they find one of the opposite sex who responds to and satisfies their *whole nature*, bodily, morally, intellectually, and then to marry as soon as they please after the woman has reached the age of twenty-one and the man that of twenty-four.

There are many circumstances, however, which make it advisable for parties who are truly betrothed to marry two or three years earlier; and if they are well instructed in the laws of life and the sexual functions and relations as all persons should be before commencing their courtship, no harm, but much good, will result. They need not "propagate their species" prematurely because they are married, nor will they, if as intelligent on this subject as they may be and should be, exhaust their unreplenishable fund of vitality in lustful instead of love indulgences.

THE SEASON FOR THE HIGHEST ENJOYMENT.—There is no greater fallacy under the sun than the familiar adage that "Youth is peculiarly the season for enjoyment." Youth has its joys and it has its sorrows, as have all periods of life. But youth is the seed-time of the soul; maturity or middle age is its summer, blooming with hopes, ambition, bright prospects, good resolves and conscious power; old age is the season of fruition, the harvest of the soul, its autumn of accomplishment and repose.

Youth is the season for development, middle age the season for achievement, old age the season for enjoyment. This is the order of Nature, whatever may be the examples of society. Why should not "the period of decline" be peculiarly the season for enjoyment—for almost unalloyed happiness? Then the passions are disciplined and subdued, the moral powers are in the ascendant, the intellect is stored with the treasures of knowledge, the mistakes and the errors of half a century have taught the lessons of wisdom—to know the

right from the wrong, and how to use all the things of the universe without abusing any; a thousand vicissitudes of fortune and many disappointments have fixed the aspirations of the immortal mind more firmly and more trustingly on "the life to come," and the varied experiences of good and ill have brought, as nothing else could, the soul to a just and true recognition of its relations to all external things and to all other beings; while the pains and penalties of its manifold transgressions have educated it into harmony with the laws of its organization—with itself, its fellow-beings and its Creator.

If any one finds old age to be a season of bodily suffering, of mental anguish, of intellectual stupor and of moral gloom, it is because of accumulated morbid conditions. He is but a wreck, a human form in ruins. Nature has kindly provided that, when the bodily organization is fully matured, the keener sensibilities are transferred from the vital to the mental domain. The vital instincts, so acute in infancy, so liable to abuse in childhood, so often perverted in youth, and so powerful in early manhood, are moderated, chastened, disciplined, and the relish for moral and intellectual pursuits is intensified, in the ascendant. Examples are numerous of men and women who have maintained good bodily health and a clear, vigorous mentality for seventy, eighty, ninety, one hundred and more years.

There is no spectacle on the earth which so challenges our respect and admiration and veneration, and which is so suggestive of divinity and immortality, and of "our Father which art in Heaven," as a human being who, having fulfilled all the duties of life, is yet living in a "green old age;" one "whose eye is not dim, nor his natural force abated," though whitened for the grave. If such persons have lived a life in accordance with the laws of life, they are not only happy in themselves but useful to the last. They are a help to others—a lamp to the feet of youth, and a guide to the middle-aged.

APPENDIX.

The following descriptions refer to the Figures on the pages as marked :

FIG. 2, PAGE 17.—BLADDER AND URETHRA.

1. Interior of bladder. 2. Urethra, its spongy portion, 3. *Corpus Caverosum*. 4. *Fossa navicularis*. 5 5. *Glans penis*. 6 6. *Septum of corpus cavernosum*. 7 7. *Crus penis*. 8 8. *Prostrate gland*. 9 9. *Cowper's gland*. 10. *Ureter*. 11. *Meatus urinarius*. 12. *Orifices of Ureters*. 13. *Orifices of Ducts of Cowper's gland*.

FIG. 3, PAGE 19.—THE TESTIS IN SITU.

1. *Testis*. 2. *Head of epididymis*. 3. *Body of same*. 4. *Tunica vaginalis*, parietal layer. 5. *Cremaster*. 6. *Artery of spermatic cord*. 7. *Spermatic cord*. 8. *Tail of epididymis*.

FIG. 4, PAGE 20.—VERTICAL SECTION OF THE TESTIS.

1. *Vas deferens*. 2. *Spermatic artery*. 3. *Vas aberrans*. 4. *Body of epididymis*. 5. *Globus minor*. 6. *Rete Testis*. 7. *Mediastinum*. 8. *Vasa recta*. 10. *Tunica vaginalis*. 13. *Tunica albuginea*. 9. *Its septa*. 11. *Vasa efferentia*. 12. *Globus major*. 14, 14, etc., *lobuli*.

FIG. 5, PAGE 21.—VASA DEFERENTIA AND VESICULÆ SEMINALIS.

1. *Base of bladder*. 2. *Line of reflection of peritoneum*. 3. *Triangular space*. 4. *Vas deferens*. 5. *Vas deferens dissected*. 6. *Vesicula seminalis duct*. 7 7. *Ureters*. 8. *Vesicula seminalis unraveled duct*. 9. *Right ejaculatory duct*. 10. *Urethra*. 11. *Prostate gland*.

FIG. 6, PAGE 24.—THE VULVA.

1 1. *Labia minora*, or *Nymphæ*. 2 2. *Labia majora*. 3. *Clitoris prepucio*. 4. *Glans clitoris*. 5 5. *Caruncula myrtiformes*. 6. *Orifice of vagina*. 7. *Fourchette*. 8. *Fossa navicularis*. 9. *Posterior commissure*. 10. *Perineum*. 11. *Anus*. 12. *Mons veneris*. 15. *The vestibule*. 16. *Meatus urinarius*.

FIG. 7, PAGE 26.—VISCERA OF FEMALE PELVIS.

1, *Vagina*. 2. *Bladder*. 3. *Interior of rectum*. 4. *The Uterus*: *a*, *fundus*; *b*, *cervix*; *c c*, *os uteri*; *d*, *Posterior portion*; *e*, *anterior portion*. 5. *Rectum*, here covered by *peritoneum*. 6 6 6. *Sacrum*. 7. *Coccyx*. 8. *Labia minora*. 9. *Labia majora*. 10. *Urethra*. 11. *Symphysis pubis*. 12. *Clitoris*. 13. *Mons Veneris*. 14. *Urachus*. 15. *Section of peritoneum*. 16. *Last lumbar vertebra*. 17. *Broad ligament*. 18. *Ovary*.

FIG. 8, PAGE 31.—THE UTERUS AND APPENDAGES—ANTERIOR VIEW.

1. *Body of uterus*. 2. *Neck of uterus*. 3. *Fundus*. 4. *Vaginal part*, anterior lip. 5. *Posterior lip*. 6. *Interior of vagina*. 7. *Broad ligament*. 8. *Ovary*, and *ligament of the ovary*. 9 9. *Fallopian tubes*. 10 10. *Fimbriated extremities*. 11. *Bristle passed through the ostium abdominalc*. 12 12. *Round ligaments*. 13. *Peritoneum*.

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