LECTURES ON THE PHYSIOLOGY AND PATHOLOGY OF MENSTRUATION.

Delivered at St. Mary's Hospital Medical School.

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LET us now turn to the systemic phenomena of menstruation. These will be found to embrace a wider range than is generally supposed comprising the vascular, glandular, and nervous systems; the viscera, skin, etc.

The changes in the *vascular system* are important; they are manifested in the veins, arteries, heart, and blood; and collectively constitute what I have (Lettsomian Lectures) spoken of as the "Vascular Rhythm" of menstruation.

The venous changes are ordinarily most conspicuous. It is a matter of common observation that menstruating women show darkness under the eyes, duskiness of the countenance, and generally a duller hue of their skin. This is mainly due to fullness of the veins and venules. This venous turgescence is the analogue and prototype of that seen in pregnancy, only that it is more fleeting; usually abating markedly after the establishment of the flow. Borden noticed the "flux variqueux."

The venous changes are appreciable by sight and touch, while those occurring in the arterial system can be measured and graphically demonstrated by the sphygmograph. This instrument shows increase of arterial tension, arising gradually three, or more days, before the flow is installed, then subsiding rapidly; the flow, indeed, would seem to herald the end of the menstrual act, but, from its remarkable nature, has arrested, almost exclusively, attention. There are, then, attending menstruation, though manifested in varying degrees, tightening up of the arteries and distension of the veins, which, having attained their acme, abate somewhat rapidly. Menstrual tension is the analogue and prototype of like arterial tension during pregnancy. This increase in arterial tension has received corroboration from the observations of the Barnes's, father and son, Putnam Jacobi and others; and I regard it as, in a more or less marked degree, a constant concomitant of oestromenstruation.

The force and rhythm of the heart's beats vary with the stage of menstruation. Rabuteau is confirmed by Hennig, as to the retardation of the pulse; while Depaul and Guéniot state that the heart seems to beat with greater force and frequency. These statements are not discrepant; they apply to different stages, varying considerably with different individuals, but distinct enough. The blood-changes accompanying menstruation are replete with interest. The condition of the blood-cells, as revealed by the microscope, is significant and interesting; and we have evidence available through the observations and researches of investigators, whose statements are in singular unison. All are agreed that, on the approach of a menstrual period, there is a decrease in the number of red corpuscles, and a relative increase of the white corpuscles; and as this change may be observed even before the flow sets in, it is attributable rather to an alteration in the process of hæmatosis than to loss in the flow.

The researches of M. Hayem on microcythæmia, and on the characters of the blood in the newly born, throw light upon this point. M. Hayem says that the smallest red corpuscles, or microcytes, are very rare in healthy adult men, while they are constantly present in the newly born, and in women at the period of menstruation. They represent an immature stage of the red corpuscles; and, as a rule, are only met with when a new crop of red cells is being produced. If pathological causes impede their development, they remain small and accumulate in the blood, and this explains their abundance in certain anæmias. These small globules always appear when there is an active production of new elements; they characterise a blood in process of evolution or reparation, and are young globules incompletely developed. The observations of Rindfleisch are confirmatory of Hayem's views. Dr. Gowers has recorded "A case of Anæmia observed with the Hæmacytometer," in which fluctuation in the number and characters of the blood-cells was observed at the menstrual periods. Dr. Gowers says:—"On each occasion, menstruation was attended by a considerable diminution in the number of the red corpuscles. It marked chiefly the first few days of the menstrual period, a rise occurring during the

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latter part. In one instance, at least, the fall in the corpuscles distinctly preceded the establishment of the menstrual flow—a fact which is in harmony with the pale appearance sometimes observable before menstruation actually begins. This would suggest that the diminution in their number is not due merely to their loss in the flow, but rather to an associated interference with the process of blood-formation." He also observed much granular material in this case. Moleschott's observations also confirm my view that there is a modification in the composition of the blood at the periods. Dr. Gowers, in discussing the pathology of splenic leucocythæmia, quotes Moleschott, respecting the normal condition of the blood as showing a relative increase of the white corpuscles during the catamenia. There is probably an increase in the amount of fibrin at the onset of menstruation, and my observations lead me to infer that this slight hyperinosis coincides with the transient rise of temperature, and, as in febrile states, with an augmentation of white corpuscles. Another point still requiring elucidation, but of much promise, is the relation of the hæmoglobin-value of the red cells to the sanguineousness of the flow, between which and the evolution of the mammalian blood-corpuscles there seems to be some correlation. According to Quinquaud, destruction of hæmoglobin goes on during pregnancy, varying with accidental conditions; and I believe an analogous change occurs during menstruation, sometimes even becoming excessive. Le Canu found the crassamentum diminished during menstruation.

The evidence adduced suggests that the blood undergoes an appreciable nutritive change at every period. There is a resemblance to fetal blood in respect of hæmatoblasts; and it would seem as if the periodical production of new blood-cells, similar to those in the newly born, led to a renewal of this vital tissue; a developmental impulse being periodically infused into it by the oestromenstrual act.

Scanzoni has observed that the periodical ripening of an ovule excites vascular disturbance; and M. Cauchois has remarked on the increased tension at the periods, in a paper communicated to the Société de Biologie. Some observations of M. Raynaud on symmetrical gangrene are interesting in this connection. Cases of what may be termed necrogenic anæmia occur chiefly in young women at the menstrual periods; it would seem to be an exaggerated stage of the condition known as *digiti mortui*. Virchow's statement that contraction of arterioles may proceed to complete obliteration of the lumen of the vessel is noteworthy in this connexion. Pouchet observed vascular plethora, and remarks: "Cabanis, who has well appreciated this state of periodical plethora, states that he has even sometimes seen it continue many years in certain women after the cessation of the catamenial flux."

The next systemic feature of menstruation for our study has reference to *temperature*. My own investigations justify the inference that the onset of the period may be accompanied by a slight elevation of temperature, a fall ensuing when the flow is established. Rabuteau says the temperature falls during menstruation; and Fricke and Oppenheim have made confirmatory observations on the temperature of the vagina and uterus before and during the periods. Berthier (*Des Névroses Menstruelles*) says: "According to Henning, the axillary temperature rises and falls in the four or five days preceding menstruation; then rises anew on the day of the appearance of blood, and redescends at the time of its cessation, to return to the normal." (*Arch. für Gynæk.*) Wunderlich agrees with Ogle that women are probably a trifle warmer than men; and he admits that they are liable to febrile disturbance about the time of the catamenia, without any special pathological process being either indicated or induced; but he thinks that normal menstruation in healthy women has, as a rule, no influence upon the general temperature of the body. But women, like children, exhibit great mobility of temperature in disease. Speaking of the lower animals, Mr. Fleming says: "The excitement of the generative apparatus reacts on the whole system, and produces a kind of fever or irritability in the animal; its sensibility is increased; the appetite is more or less in abeyance, or capricious; and usually there is thirst." I am indebted to my friend Dr. Langdon Down for valuable confirmatory evidence herein, as well as in relation to menstruation generally in idiots.

The *nervous system* evinces its implication in many ways. Changes in the mental condition of menstruating women are manifested by alteration in temper, usually in the direction of greater irritability. Among idiots greater waywardness, restlessness, cunning, secretiveness, and destructiveness are observed; very like what occurs in the lower animals. The conduct of Rachel at Mizpah is suggestive. Those acquainted with asylum-work are familiar with the alterations in the mental state of many women at their periods; and it is noteworthy that these are not uniformly of a detrimental character. Nervous affections are apt to become aggravated at the periods; and I have

met with cases of menstrual epilepsy, one recently at St. Mary's Hospital, in which fits and suicidal tendencies occurred only in the premenstrual stage. Menstrual asthma is not unknown; and migraine and certain neuralgic and other nervous disorders are notoriously frequent at the periods.

Periodical melancholia, associated only with the catamenia, has been witnessed many times. Maudsley remarks that, in women prone to hysterical insanity, "outbursts of temper become almost outbreaks of mania, particularly at the menstrual periods;" and Laycock says, "but it should be observed that all mental alternatives act more powerfully on women at the menstrual period, and during or just after delivery, than at other times."

Mental excitement is often strongly marked in the lower animals at the breeding season. Mr. Bartlett, the able superintendent of the Zoological Gardens, says: "I believe the brain is greatly influenced by this condition, for under the pressure many females, wild at other times, allow themselves to be handled as though they were quite unaware of surrounding circumstances. Female elephants, however, otherwise perfectly tame and manageable, become furious and dangerous at the periods of sexual excitement." The "tetchiness" of women at their periods is so well known, that allowance is (or ought to be) made for their infirmities at this season. Some are conscious of a decided increase in their mental powers just before the periods, mostly in the direction of augmented perception, a faculty as peculiarly a feminine attribute as is judgment of the opposite sex.

Mention has been made of changes in the hue of the skin from increased vascularity; but there are other phenomena apparent in the dermal tissues. Not only is the complexion duller, but there is a decided increase in the pigmentation of dermal structures. In many women the hair darkens, as in pregnancy, it may become moist and adhesive, and shedding may occur. Freckles—especially observable in the xanthochroic—deepen in colour, and so do the areolæ of the nipples, as Laycock pointed out. There is often a material increase in amount, as well as alteration in quality, of the sweat and odorous secretions. In some this is so marked as to become oppressive and annoying, on which account women are apt to resort to the lavish use of perfumes. The odour exhaled by certain menstruating women is so significant, that other persons can detect their condition. In some persons, menstruation is ushered in by profuse and offensive sweating, especially of the feet and axillæ. Besides increased action of the normal functions of the skin, we find a marked proneness in women to eruptions at their periods, so that many know that a period is heralded when a customary eruption occurs, e.g., acne, eczema, etc.

These manifestations of activity in the ectoderm are analogous to similar changes occurring in the lower creatures. In monkeys certain pigmented parts become much more highly coloured at the periods, as in the rhesus and mandrill; and other mammalia show like changes. The elephant, during "must," develops two cutaneous glands under the eyes, which exhale an odorous secretion. In birds, reptiles, and fishes, similar changes occur. The brilliancy of plumage during courtship is marked in the birds, and they subsequently become dull and moult. It is so with reptiles and fishes, whose colours are much brighter periodically; it is so with insects and with flowers. Laycock, Darwin, and Herbert Spencer have all commented on these facts. Mr. Spencer says (*Biology*, vol. ii, p. 253): "This seems as fit a place as any for noting the fact that the greater part of what we call beauty in the organic world, is in some way dependent on the sexual relation. It is not only so with the colours and odours of flowers; it is so, too, with the brilliant plumage of birds, and with the songs of birds, both of which, in Mr. Darwin's view, are due to sexual selection; and it is probable that the colours of the more conspicuous insects are, in part, similarly determined. The remarkable circumstance is, that these characteristics, which have originated by furthering the production of the best offspring, while they are naturally those which render the organisms possessing them attractive to one another, directly or indirectly, should also be those which are so generally attractive to us, those without which the fields and woods would lose half their charm. It is interesting, too, to observe how the conception of human beauty is, in a considerable degree, thus originated; and the trite observation, that the element of beauty, which grows out of the sexual relation, is so predominant in æsthetic products, in music, in the drama, in fiction, in poetry, gains a new meaning when we see how deep down in organic nature their connection extends."

In association with these ectodermic phenomena are analogous changes occurring in the endoderm, or mucous lining. Thus, diarrhoea is not uncommon, though many have constipation; and it is curious that women who pass membranous shreds from the bowel, are more liable to do so near their "periods" than during the interval. They may even pass casts of small portions of the tube. These mem-

branous exfoliations occur with greater frequency in women than in men. Mr. Whitehead (*Mucous Diseases*) says: "Of one hundred cases, four only occurred in males." Mucous flux from the stomach may occur, with pyrosis, vomiting, flatulence, hunger, inappetence, etc. Coryza, sneezing, and bronchial catarrh, accompany every period in some, who say their "courses begin with a cold."

These phenomena suggest increased activity (proliferation) in the epithelial structures, followed by shedding, and present analogies with the moult in lower creatures. The corresponding changes which take place in the uterus have already been referred to.

Mr. Whitehead (*Mucous Diseases*) says: "Membranous dysmenorrhœa frequently occurs with women suffering from this disease." The discharges of membrane and mucus occur periodically. Courty shows that Huchard, Labadie-Lagrave, Gautier, Heyfelder and others share this view.

Turning to the *glandular system*, we find equal evidence of implication. Without interrupting our subject, I would here remind you of a fact to which your attention has already been directed, namely, the intimate relations that exist throughout the animal world between the renal excretory and the reproductive organs. Even in man these organs are in close association, and have a common efferent duct.

The *kidneys*, then, are organs meriting attention in these relations, and the condition of the urine shows that their function is altered. Many women experience urinary disturbance at the periods. Some have scanty thick urine, others an abundance of limpid water; and nearly all complain of irritability of the bladder.

Rabuteau has shown that there is a diminution of twenty per cent. in the excretion of urea during menstruation. Change in the quality of the renal excretion is not the only evidence of implication of the kidney. The organs have been known to exhibit appreciable alteration in their size, and there are grounds for attributing this to fluxionary hyperæmia.

An interesting corroboration herein is afforded by Dr. William Roberts in his article on "Movable Kidneys" in Reynolds's *System of Medicine*, where he says, respecting its etiology, "Becquet (*Arch. Gén.*, 1865) has enunciated a novel theory to explain the liability of women to mobility of the kidneys. He says: 'On the breaking forth of the menstrual flux, the kidneys are associated in the congestion of the generative organs, and become swelled. This fact, less rare than is usually supposed, perhaps even physiological, does it not explain the renal pain so often felt at the menstrual periods, especially in women who are subject to dysmenorrhœa? Thus swelled and rendered heavier, the kidney, and especially the right kidney, strains the feeble attachments which retain it, and tends to start out of its place. Soon the congestion subsides, and the organ returns to its original position; a second congestion displaces it further, and a third still more. The kidney, becoming each time heavier from the incompleteness of the resolution, comes to occupy a lower position; and then gradually and at length, but not without suffering, breaks loose, and floats in the abdominal cavity.'

"In a case under the observation of the writer, the displaced and movable kidney seems to become larger two days before the catamenia appear. It becomes sensitive to the touch, and at times somewhat painful, even without being touched; and in a case observed by Dr. Ritchie, and cited by the writer, an opportunity was afforded of watching the condition of the kidney during two menstrual periods, when its size was seen to be increased by fully one half, and it was much more sensitive to the touch. These facts, so far as they go, lend an air of feasibility to the theory of Becquet." Péan also mentions Becquet's case, and states that Martineau (*Thèse*) relates another, and that M. Peter also published one in his edition of Trousseau's *Lectures*, while Courty's statements are corroborative, as also are those of Newman, Sawyer, and others.

Menstruation may form a kind of test of renal integrity, inadequacy being betrayed at first only at the periods.¹ Thus Dr. W. Roberts mentions a case in which paroxysms of uræmic convulsions coincided with the catamenial periods, and I have seen corroborative instances myself, mostly in women at the change of life.

Menstrual jaundice has been observed, i.e., jaundice occurring only in association with menstruation. Senator has recorded instances, attributable, apparently, to hepatic hyperæmia and consequent catarrh. Thierfelder and Ponfick discuss the subject also, and so does Fasbender.

In addition to catarrhal hyperæmia, it seems probable that some cases may be due to blood-change, and form one variety of hæmatic jaundice.

The relations of this subject are extremely interesting, and it

¹ I am indebted to Dr. L. Sedgwick for a striking illustration of this kind.

seems probable that, with advancing knowledge, we may find further evidence of the powerful influence exerted by the liver on the formation and destruction of the blood.

Thierfelder (*Hyperæmia of the Liver, Von Ziemssen*, vol. ix, p. 63) says: "There are often manifested at the menstrual epochs symptoms of hepatic congestion, occurring either in place of the uterine flow, or immediately preceding it, or after it has ceased sooner or more abruptly than usual. Here there occurs manifestly a determination of blood to the liver, which, it is extremely probable, is connected with the excitation of the nerves referable to the maturing ovum, induced by a reflex mechanism like that involved in the afflux to the genital organs. We cannot always in such cases demonstrate the presence of influences which, as is shown by experience, may tend to produce disturbance in the latter organs, such as sudden chills, violent mental emotions, etc.; and even when such influences are present, it remains almost always inexplicable why the reflex process, which in the genital organs is either not at all or only to a slight degree operative, is transferred directly to the liver. Equally obscure is the mode of origin of those forms of hepatic congestion which occasionally make their appearance during the climacteric years, and afford evidence of their etiological relation to the menopause, not only by their simultaneous occurrence, but also by the circumstance that they temporarily disappear, or at least become modified, as often as menstruation again recurs."

With reference to the spleen, I have the impression that it is susceptible of fluxionary hyperæmia. The relations of this organ to the function of hæmatisis, though obscure, are replete with interest. It accords with my observations of splenic disease, that certain forms may be productive of menstrual derangement.

Lastly, there is the system of *lymphatic, or absorbent, glands*. This is active during menstruation. Observation has assured me that there is increased aptitude for the absorption of poisonous effluvia at these times; and has led me to believe that there is greater susceptibility towards infectious diseases.

The annexed passage from an article on "Periodicity," by Dr. Laycock, supports the view, long since formulated by me, that menstruating women are more liable to be affected by poisonous effluvia and emanations at their periods than during the intermenstrual epochs. Laycock's law is that there are in all persons, male as well as female, "critical days" in health, and that at such times their receptivity to disease is increased, a less healthy state of the system at large being induced, whereby their resisting power is lowered. This is obvious enough in women at their "monthly periods;" but, that being a multiple of an hebdomadal period, Laycock suggests that at each constituent multiple, or every seven days, the liability, though not so great, is still the subject of some augmentation. He says: "According to my previous statements, depression of the system takes place at the critical days of health, and consequently an exanthem, or other fever depending on a poison, is more likely to appear on these days than on any other; and, by parity of reasoning, the symptoms are most likely to be violent (when the disease has once broken out), or, in other words, a paroxysm to appear, on the same days; consequently, the critical days of health and the critical days of the fever will be identical."

But we must not lose sight of the possibility that a menstruating woman may poison a lying-in patient upon whom she is in attendance. This may occur when the emanations, cutaneous and other, from the menstruant are of an offensive and acrid character.

Active and capable monthly nurses are preferable to the elderly women, who have long usurped this branch of nursing; but they should be cleanly, healthy, sound, and wholesome women, with no menstrual taint about them.

Dr. Tilt quotes a case in which an otherwise apparently well fitted wet-nurse caused an erysipelatous eruption to appear on the baby she suckled every month at the time of her menstruation. The eruption ceased permanently when the child was weaned.

The *thyroid body* undergoes enlargement. In some women, it enlarges perceptibly at each catamenial period. Laycock quotes Reid as mentioning that, "the custom of the ancients of measuring the bride's neck the day after marriage, is still followed in Germany." It is noteworthy that goitrous tumours seldom arise before puberty, and that they display exacerbation during menstruation, and sometimes during gestation; though diminution may follow conception. In exophthalmic goitre, the concurrent vascular commotion is intensified when the augmented tension of menstruation comes into play. This has been remarked by Trousseau (*Clin. Méd.*), according to whom there are intimate relations between menstruation and exophthalmos. He says: "Most of the women who have Graves's disease, suffer from amenorrhœa also. In the beginning, menstruation is only disturbed, but is after a time completely suppressed, and hopes of a favourable issue are not to be entertained until this function is perfectly re-established.

This is an important prognostic sign." The vaso-motor derangements are here very pronounced.

The *salivary glands* may show increased activity. Perhaps there is some alteration in the saliva, for complaints are occasionally made of an altered taste in the mouth, especially of acidity. The lacrymal glands usually secrete more tears towards the catamenial periods, women being then more emotional and lacrymose; but dryness of the eyes and nose is occasionally complained of.

The *breasts*, which are sexual glands, also display increased activity. They become fuller, harder, tenderer, and slightly painful. The veins are fuller and more visible; the nipple more erectile; the areolæ darker. Kölliker has observed like symptoms. Some breasts secrete a little milk at these times. In this connection, an observation of Dr. Barnes is interesting. He says that he has observed that colostrum-globules were reproduced at every menstrual epoch in women who were suckling.

The facts laid before you surely justify the inference that menstruation consists in a profound nutritional wave affecting the whole body, and that it is not solely confined to the pelvic viscera, though the latter are customarily the channels whereby the prominent features of the function are ordinarily made manifest.

Briefly summarised, the leading phenomena of menstruation show singular analogies with those of pregnancy and parturition; the cardiovascular changes mimic those characteristic of pregnancy; the alteration in the blood is proto-typical; so are the pigmentary changes; and the dehiscence of epithelial structures is a miniature moult foreshadowing that which follows parturition when the completer genesial cycle has been accomplished.

The birth of the ovule is a parturition in miniature; there are rhythmic uterine contractions, decidual shedding, and expulsion of blood. The breasts denote their readiness to share in the reproductive act. The exaltation of function in the nervous system, and the activity of the glandular system, are alike significant. Even in its remotest fibres, the organism feels and displays the systemic commotion attendant upon the reproductive act; it is a nutritional wave affecting every fibre of the organism.

You may remember that, at the outset, I alluded to the probability that a law of periodicity governed the reproductive function in all creatures. Its operations have been remarked, but have not yet been fully demonstrated. Difficulties encompass its elucidation; but I believe that observation and research, by eventually clearing up the obscurities now surrounding it, will afford a scientific basis for future study.

If, by directing attention to the subject, I can enlist the observation and reflection of others more competent, I shall be content; for, as H. Spencer well remarks (*Principles of Biology*, vol. i, p. 408): "Not directly, but by successive approximations, do mankind reach correct conclusions; and those who first think in the right direction, loose as may be their reasonings, and wide of the mark as their inferences may be, yield indispensable aid by framing provisional conceptions, and giving a bent to inquiry."

And Laycock says, referring to the subject of periodicity: "The axiom that the whole is equal to the sum of all its parts is universally true, whatever the parts may be; and there is really no reason for despairing that we shall ever attain to a knowledge of the whole alluded to (a knowledge which must necessarily be derived from the knowledge of its parts), because those parts are microscopically small to the intellect. The boundaries of astronomical science have been pushed from small and obscure beginnings into the infinite in space, time, and number; and who can tell but that Providence may so assist the humble inquirer into nature, that science shall be extended to the infinite in littleness? And so, ultimately, man may be able to look down, by the light of philosophy, upon the varied phenomena of terrestrial life—their multifarious combinations and complexities, their cycles and epicycles—as he looks into the planetary world, and see nothing but order and simplicity where now there appears inextricable confusion. Assuredly the direction of this summit of clear perception is obvious. The road to it only wants hewing and digging, and diligently working at."

I have already brought under your notice some facts showing that the lower animals exhibit a seasonal aptitude for procreation; and that this, at any rate in the wild state, is most observable in warm seasons when food begins to be more abundant, so that it has long been remarked that the spring is the season of love. Domestication, by providing artificial warmth and food, increases fertility; but still the periodical influence, though its rhythm may be changed, is not lost, for we observe a markedly greater tendency to breed in warm than in cold seasons. Darwin has remarked this, and Herbert Spencer (*Biology*) says: "Again, the annual return of æreative activity has

an average correspondence with the annual return of a warmer season, which, did it stand alone, might be taken as evidence that a diminished cost of heat-maintenance leads to such a surplus as makes reproduction possible. But then this periodic rise of temperature is habitually accompanied by an increase in the quantity of food—a factor of equal or greater importance." There is, then, in a state of nature, periodically greater aptitude, recurring at long intervals, and which may be called seasonal. This is imitated by women, particularly by those who menstruate only in summer, or quarterly. It would seem probable that, in remote times, mankind bred chiefly in the spring or warmer months, as the lower non-domesticated animals now do. But civilisation, operating on man's ancestors as domestication now does upon the lower animals, by providing warmth and increasing the supply of food, has also promoted the fertility of the human species, and rendered man capable of reproduction at all times and seasons; the normal rhythm thus being broken somewhat in its relations to external, e.g., seasons; but still preserving traces of its origin, and tending to revert, when unhindered, to its normal equilibrium. With kindred thoughts in my mind, I cherished the conviction that women were more prone to conceive, and consequently to give birth, at certain seasons than at others; and thought that possibly inquiry might show some law pervading this proclivity. The data available in one's immediate circle showed that, in large families, the birth-months tended to group themselves at certain seasons, while in other months there were few or no births. The birthdays of our Royal Family illustrate this. My inquiries into the comparative physiology of menstruation and reproduction lead me to infer that the law governing the epochs of reproduction is mainly the appanage of the female sex, if not a quality peculiarly pertaining to it. But it is questionable whether or not the birth-months of a given family may not sometimes follow the paternal rather than the maternal type. That of the mother certainly seems to predominate, as might be expected, seeing that probably most women have seasonal aptitudes for procreation. Still, something may depend upon the *vis*, and perhaps the age, of the father, and obviously on the time of marriage.

Similar views have excited the minds of others. Thus Lombard, in his great work on *Climatologie Médicale*, says the subject has been studied by Villermé (*De la distribution par mois des conceptions et des naissances de l'homme*), and by Boudin. It results that the epoch most favourable to conception is the spring-time and the beginning of summer; the least favourable, the end of summer and beginning of autumn. These epochs are retarded in cold countries, and hastened in hot countries. If it be exact to attribute the annual march of conceptions to solar periodicity, their augmentation with the return of spring-time, and their diminution with autumn, the converse should take place in the southern hemisphere, where the seasons are reversed, and this is found to be the case. Lombard thinks the following physiological law is justified by the researches that have been made: "Plethora augments the number of conceptions, whilst anæmia diminishes the activity of the organs of reproduction."

Laycock asks: "Do the spring and autumn influence the reproductive organs of man? The Greeks were of opinion that it did. Oribasius, in his *Synopsis*, quotes from Rufus to the effect that the sexual feeling is most strong in spring, and least ardent in autumn; and Aetius makes the same quotation. This, also, at the present day is the popular opinion, and appears to be founded in fact; for M. Quetelet states, as the result of extensive statistical inquiries, that, in woman, most conceptions take place in May, and fewest in October."

In the *Archiv für Gynäk.*, Band xv, Heft 2, s. 220, 1879, is an article by Cohnstein, "Ueber die Prädispositionszeiten der Schwangerschaft." After discussing the different causes to which abortions are attributable, he explains how a fact in his practice, without perceptible cause, led him to this question, Has not each woman an epoch in the year when she is most susceptible of conceiving? and, consequently, ought not one to reject the opinion generally admitted, that woman offers the same disposition to become pregnant at each epoch of the year? He examined the *Almanach de Gotha* for 1879, where he found that, in 521 families of two or more children of different ages, the days of confinement fell 298 times in the same month, representing 52 per cent. of cases. But, as the duration of pregnancy is not absolute, and that with the same woman, the author admits that he must consider as corresponding to the same epoch two deliveries, of which the days are not more than two or three weeks apart. Regarded thus, to the preceding 298 cases must be added 121 cases where the days of confinement, though not belonging to the same month, correspond to a like epoch of pregnancy.

Extending his previous researches, Cohnstein procured statistics of Heidelberg and eighteen communes, which gave in round numbers five thousand families of two or more children of different ages; and the

comparison of the days of confinement on the list confirmed the idea that there must be admitted for each individual epochs of predilection for pregnancy. Thus, for example, taking account of families having more than two children, he established that 62 times per cent. all the days of delivery fell in the same season for the same woman, and 48 times per cent. in two or three consecutive months.

We have evidence, then, of rhythmicity, cyclicity, or periodicity.

Further inquiry shows that all the reproductive processes—œstrogenation, incubation, gestation, and parturition—are carried on in periods that are multiples or submultiples of weeks; monthly periodicity being especially characteristic of the processes in the human species and in the higher mammals. How is this hebdomadal periodicity constituted? Dr. Graves (*Clin. Lect.*, 2nd ed., 1864, p. 271), speaking of intermittent fevers, says: "As the average period of day and night respectively is twelve hours, in the same manner equivalent spaces of time seem to be destined for the successive and alternating revolutions of the living system. It would be extremely interesting to consider what influence their adoption might have in our calculations concerning the crisis of continued fevers. We would not, then, count three days and a half, but seven half days; we would not say seven days, but fourteen half days. If this method were adopted, many of the apparently anomalous critical effects and critical terminations in continued fevers, would, I have no doubt, become strictly conformable to some regular law of periodicity. To arrive at a knowledge of this law would be of the greatest importance, and would tend much to render our knowledge of fevers more accurate, and our treatment more efficacious. Those who entirely deny the critical period must be either very superficial observers, or very indifferent practitioners."

This twelve-hour period, be it observed, is a tidal period, the importance of which in initiating and infusing the impress of rhythmicity on the animal world has been ably indicated by Mr. Darwin.

Darwin (*Descent of Man*, p. 8) says: "Man is subject, like other mammals, birds, and even insects (as Dr. Laycock had already shown), to that mysterious law, which causes certain normal processes, such as gestation, as well as the maturation and duration of various diseases, to follow lunar periods." Laycock had already shown this.

Again (*ibid.*, p. 161): "In the lunar or weekly recurrent periods of some of our functions, we apparently still retain traces of our primordial birthplace, a shore washed by the tides;" and (p. 164): "The most ancient progenitors in the kingdom of the vertebrata, at which we are able to obtain an obscure glance, apparently consisted of a group of marine animals, resembling the larvæ of existing Ascidians. The inhabitants of the seashore must be greatly affected by the tides; animals living either about the mean high-water mark, or about the mean low-water mark, pass through a complete cycle of tidal changes in a fortnight. Consequently, their food-supply will undergo marked changes week by week. The vital functions of such animals, living under these conditions for many generations, can hardly fail to run their course in regular weekly periods. Now, it is a mysterious fact that, in the higher and now terrestrial vertebrata, as well as in other classes, many normal and abnormal processes have one or more whole weeks as their periods. This would be rendered intelligible if the vertebrata are descended from an animal allied to the existing tidal Ascidians. Many instances of such periodic processes might be given, as the gestation of mammals, the duration of fevers, etc. The hatching of eggs affords also a good example; for, according to Mr. Bartlett, the eggs of the pigeon are hatched in two weeks; those of the fowl in three; those of the duck in four; those of the goose in five; and those of the ostrich in seven weeks. As far as we can judge, a recurrent period, if approximately of the right duration for any process or function, would not, when once gained, be liable to change; consequently, it might be thus transmitted through almost any number of generations. But, if the function changed, the period would have to change, and would be apt to change almost abruptly by a whole week. This conclusion, if sound, is highly remarkable; for the period of gestation in each mammal, and the hatching of each bird's eggs, and many other vital processes, thus betray to us the primordial birthplace of these animals."

Schroeder (von Ziemssen's *Cyclop.*, vol. x), quoting from Krieger's work *Die Menstruation*, says: "Krieger frankly declares, in his painstaking work, that, because menstruation is a crisis, and all crises occur at periods of seven days, or are divisible by seven, so every menstruation is pathological which does not adhere to the twenty-eight day type." It would be more accurate, perhaps, to say, some multiple of the seven-day type.

Rhythmicity is built up in our earliest fibres, and dominates our lives in a fashion but little recognised. We breathe rhythmically; our hearts beat rhythmically; we eat, drink, and sleep rhythmically; and, in short, all the chief functions of our organisms are carried on

rhythmically. It is one of the essentials of that condition of moving equilibrium without which existence would be impossible. All evolution tends towards equilibrium. As Spencer says (*Data of Ethics*, p. 72): "This truth is clearly disclosed on observing how those physiological rhythms which vaguely show themselves when organisation begins, become more regular, as well as more various in their kind, as organisation advances. Periodicity is but feebly marked in the actions, inner and outer, of the rudest types. When life is low, there is passive dependence on the accidents of the environment; and this entails great irregularities in the vital processes. . . . Much higher up, we still find very imperfect periodicities, as in the inferior molluscs, which, though possessed of vascular systems, have no proper circulation, but merely a slow movement of the crude blood, now in one direction through the vessels, and then, after a pause, in the opposite direction. Only with well-developed structures do there come a rhythmical pulse and a rhythm of the respiratory actions. And then in birds and mammals, along with great rapidity and regularity in these essential rhythms, and along with a consequently great vital activity, and therefore great expenditure, comparative regularity in the rhythm of the alimentary actions is established, as well as in the rhythm of activity and rest; since rapid waste, to which rapid pulsation and respiration are instrumental, necessitates tolerably regular supplies of nutriment, as well as recurring intervals of sleep, during which repair may overtake waste."

Primarily rhythmicity operates through, and depends upon, nutritional changes; and we have seen that such changes largely influence our organisms. Laycock, who has written on a general law of vital periodicity, says, in his work on the *Nervous Diseases of Women*, in a summary: "First, that at hebdomadal periods, or their multiples, a change occurs in the system of all animals; and that at puberty, and at each menstrual period subsequently, the sexual organs of the female share in this change in common with the whole system; the phenomena resulting being those of menstruation; and that, consequently, the flow of the catamenia is no more than a local effect of the general cause. Second, that the system of all animals undergoes changes about the vernal and autumnal equinoxes, and probably about the summer solstice, in which the generative organs and their dependencies partake; and that these changes modify in mankind all diseases, but those more particularly connected with the reproductive functions."

Darwin (*Descent of Man*, p. 161) says: "In the lunar or weekly recurrent periods of some of our functions we apparently still retain traces of our primordial birth-place, a shore washed by the tides."

Laycock (*Lancet*, vol i, 1842-3), having shown that hebdomadal periodicity pervades the animal world from insects up to man, observes: "The facts I have briefly glanced at are general facts, and cannot happen day after day in so many millions of animals of every kind, from the larva or ovum of a minute insect up to man, at definite periods, from a mere chance or coincidence; and although temperature, food, domestication, and other modifying circumstances, may and do interrupt the regularity with which the various processes I have alluded to are conducted, yet upon the whole it is, I think, impossible to come to any less general conclusion than this, that, in animals, changes occur every 3½, 7, 14, 21, or 28 days, or at some definite number of weeks."

Evidence is not wanting, then, to show that the periods of gestation, incubation, and oestro-menstruation are made up of periods that are multiples of weeks, and that these seven-day periods are likewise constituted by twelve-hour periods, multiples of which (twice seven) make our weeks. The twelve-hour period is a tidal period, which periodically undergoes fluctuations—high tides and low tides—a complete cycle of tidal changes being gone through in a fortnight, as Darwin has shown. He also has stated (*Descent of Man*, p. 8): "Man is subject, like other mammals, birds, and even insects, to that mysterious law, which causes certain normal processes, such as gestation, as well as the maturation and duration of various diseases, to follow lunar periods."

The changes that arise are fundamentally nutritional; and this reflexion furnishes the key to the processes that are so influenced. It is through subtle changes in nutrition, worked out in obedience to the law of periodicity, that the reproductive function operates.²

² The whole subject of Menstruation—its Evolution, Physiology, and Pathology—will be fully elaborated in a work shortly to be published by myself, these lectures being necessarily much condensed.—A. W.

A LINIMENT FOR RHEUMATISM.—The *Quarterly Therapeutic Review* says methyl salicylate (oil of wintergreen), mixed with an equal quantity of olive-oil or linimentum saponis, applied externally to inflamed joints affected by acute rheumatism, affords instant relief; and, having a pleasant odour, its use is very agreeable.

AN ADDRESS

ON

THOUGHTS ON EDUCATION.

Delivered at the Seventh Annual Meeting of the Dublin Branch, January 31st, 1884.

By EDWARD HAMILTON, M.D. Dublin, Late President R.C.S.I., President of the Branch.

My first duty, gentlemen, is to thank you for the honour you have done me in electing me your President. When I recall to mind the names of those who have preceded me in this chair, I feel the distinction a very high one, and prize it very greatly. Like most such positions of honour, it carries with it a penalty which presses on yourselves as well as on me. I am obliged to make a speech of some kind or other, and you are condemned to listen to it. Thinking over what I should say to you, I tried to find if there was any subject on which I could speak to you with any degree of authority, resulting from unusual opportunity of observation, or from experience more extended than may fall to the lot of my hearers.

Having spent some of my early life in school-work, amid the active energies of teaching, and having of necessity watched with some interest the phases which this important department of our professional life has undergone, I feel that any opinions I may express will have at least the weight due to maturity, and be the outcome of prolonged and anxious thought.

I am, however, met by the difficulty that the subject has been worn threadbare, and has been already discussed by some of the ablest and most thoughtful amongst us; but we cannot regard it as exhausted when we consider its gravity, as it concerns not only our own profession, but every individual who has life to be jeopardised or health to be impaired by ignorance or incompetence.

Viewing the entire system of education at the present time, three conditions arrest the attention: the great increase in the number of subjects which constitute the sum total of a liberal education; the briefness of the time in which they have to be acquired; the expansion of the examination-system and so-called judgment by results.

Steam and electricity have fused the nations of the world into one great family, modern languages, formerly accomplishments, are now a necessity, and have displaced, in a great measure, the so-called dead languages. They must, however, be chiefly colloquial, and cannot supply the culture and intellectual training which is afforded by the study of the ancient classics—mental callisthenics, as they have well been called. Again, our social progress has rendered necessary a knowledge of all branches of physical science. Hence, if we look into the schools, we do not now find the overgrown head form toiling over ponderous volumes of Greek and Latin classics, preparing for the over-weighted entrance-examination. The youth at fifteen is now an undergraduate, and at two-and-twenty will have completed his professional course and stepped into the arena equipped for the battle of life. In this rapid race of education, how little opportunity is afforded for the formation of individual character, or the development of reason and personal judgment! Memory, the mere faculty of retaining communicated knowledge, is the rope of sand on which modern education hangs; it is the fetish which our teachers worship; the philosopher's stone which can turn everything to gold. Memory—a valuable gift no doubt, and well worth cultivating—I cannot regard, with Mr. Stokes, as the total of man's faculties. By simple memory, our horses stop at the doors where we are wont to visit in our daily rounds. By simple memory the child in its nursery will in a few months learn its mother tongue, a feat far surpassing anything which it can attain in maturer years.

It is, I believe, now very generally admitted that the flippant answerers at competitive examinations fail in administrative capacity, where hard facts have to be dealt with by common sense, unaided by books or the tips of the tutor, looking to result-fees. And here we may pause to inquire—is State interference in this direction wise or equitable? Do not result-fees offer a direct inducement to teachers to take up the quick and brilliant boy, who, by mere power of memory, can win money for them, and neglect the dull and heavy boy, the boy who most needs the teacher's care? I have no hesitation in saying that the honest education of one of these is a greater triumph of scholastic skill, a nobler work of humanity for the public good, than