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REFLEXES—THE INGOING IMPULSES AND THEIR PSYCHIC CORRELATIVES.

THE ANNUAL ADDRESS TO THE AMERICAN MEDICO-PSYCHOLOGICAL ASSOCIATION, MONTREAL, JUNE 18TH, 1902.

BY

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Professor of Physiology in McGill University, Montreal.

MR. PRESIDENT AND GENTLEMEN:—

I must begin with an explanation, if not an apology. Owing to the unfortunate illness of my colleague, Professor Wyatt Johnston, who had been regularly appointed to give this address, it became necessary to find a substitute. So, Dr. Burgess, who has done so much work of a kind of undoubted value, undertook that of a more questionable kind when he attempted to refill so important a position at the eleventh hour. He came to me, possibly because of the interest he knows me to take in psychiatry and kindred subjects. That was about one month ago, and as I was then under promise to prepare two papers to be read at the meeting of the Royal Society of Canada, which met on the 27th of last month, and as I had of necessity to examine at least one hundred students orally and by lengthy written papers on my return, I now wonder at my rashness in consenting to appear before you. But, as some evidence against downright lack of sanity, allow me to explain that Dr. Burgess came on a holiday, when, therefore, I was not under the influence of my usual mental tonus—when my loins were not girded up. Moreover, I had just been reading something from the Doctor's pen that was suffused with poetry, so being without the necessary protection of hard sense, he spoke as with enchanted words and the shafts of his argument did penetrate

between the joints of my armour thus loosely put on; and in an evil hour I did consent, with the result that ten days ago I found myself worn out with the monotonous and exhaustive work of examinations and with not so much as a rough note ready for this occasion—and all in spite of my most strenuous endeavors. So, gentlemen, I pray you, kindly accept of the best I can give you under the circumstances, and be assured that I prize most highly the honor of addressing you as the representatives of a large body of men who are doing a noble work and one accomplished in many cases under difficulties which you yourselves best understand.

My subject is entitled :—"Reflexes, the In-going or Afferent Impulses and their Psychic Correlatives."

Protoplasm, whether in the plant or animal, is distinguished by its power to react by movement to a stimulus. Nor is this haphazard, for even in the unicellular Amœba and still more in the simple multicellular Hydra, is there already to be observed the beginnings of motor localization. In the Bell Animalcule with its more or less definite or rhythmical movements, we are reminded of the periodic discharges of the respiratory centre of vertebrates. In the earthworm there is a nervous mechanism which results in all the segments of the creature working together in harmonious movements. Yet when the head-end is removed the difference is not what might have been expected by the student who knows only vertebrate anatomy or physiology, much less by the uninitiated. When the worm is cut into segments these still move, and when the divisions are not too small, to some purpose too, and in such a case there can be no question of a brain or will. The nervous system of each segment does not differ greatly from an imaginary simplified segment of the spinal cord of the vertebrate. Perhaps we may with greater accuracy, in some respects, compare it with the sympathetic system of the vertebrate. In any case it must be plain that movements so far as they are dependent on the nervous system, are the outcome of the effect of the external world acting directly as a stimulus; we find in some of the worms the body of the sensory neurone, not as in the vertebrate usually in the spinal or other ganglia in proximity to the main centres, but actually in the skin itself, so that it is clear that there is an admirably simple structural provision made for telegraphing the messages inwards.

There is no anatomical difficulty in the conception that the movements of the worm are largely reflex, whether in the intact or sectioned animal. It will be well to bear in mind throughout what constitutes the simplest anatomical mechanism for a reflex action according to modern conceptions. Using the term neurone to mean the nerve unit or nerve cell, we require for reflex action at least one

afferent and one efferent neurone. According to some, the connection between the two neurones centrally is not made directly by the processes of the cell body but by an "intermediate" or "shunt" cell. The diagrams shewn will make this clear. Besides, in nature we must al-

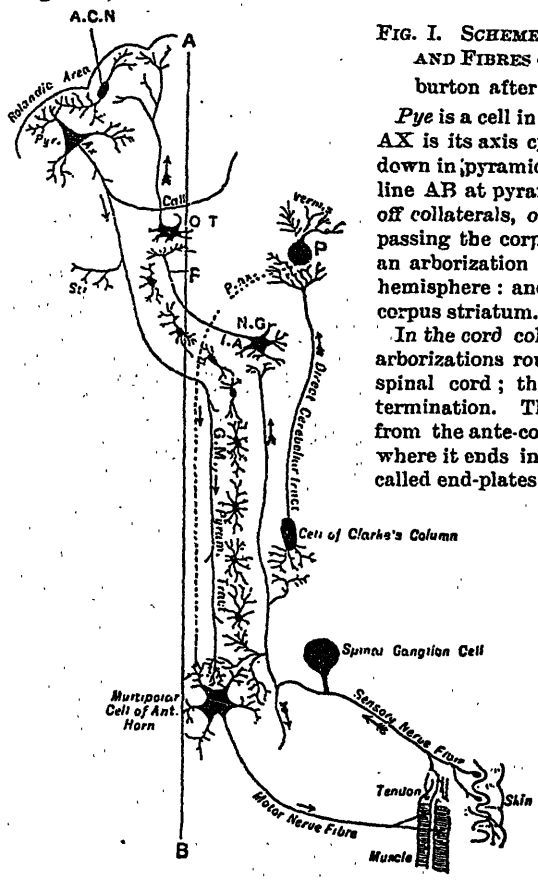


FIG. I. SCHEME OF RELATIONSHIP OF CELLS AND FIBRES OF BRAIN AND CORD. (Halliburton after Mott.)

Pye is a cell in the Rolandic area of cortex. AX is its axis cylinder process, which passes down in pyramidal tract and crosses middle line AB at pyramidal decussation. It gives off collaterals, one of which (*call*) is shown passing the corpus callosum to terminate in an arborization in the cortex of the opposite hemisphere: and another (*slr*) passes into the corpus striatum.

In the cord collaterals pass off and end in arborizations round cells of the ante-horn of spinal cord; the main fibre has a similar termination. The motor nerve fibre passes from the ante-cornual cell to muscular fibres where it ends in the terminal arborizations called end-plates.

Coming now to sensory fibres, a cell of one of the spinal ganglia is shown. Its axis cylinder process bifurcates, and one branch passes to the periphery ending in arborizations in skin and tendon.

The other (central) branch bifurcates on entering the cord and its divisions pass upward and downward, the latter for a short distance only.

The main ascending branch arborizes around a cell of the nucleus gracilis (N.G.) or nucleus cuneatus. The axis-cylinder process of this cell passes over to the other side as an internal arcuate fibre (I.A.) and becomes longitudinal as one of the fibres of the mesial fillet (F.) which terminates round a cell of the optic thalamus (O.T.) from which a new axis cylinder process passes to form an arborization around the dendrons of one of the cerebral cells (A.C.N.).

The axis cylinder process of A. C. N. arborizes round the dendrons of *Pye* from which we started.

Cerebellum.—A collateral of the sensory nerve fibre arborizes around a cell of Clarke's column from which a fibre of the direct cerebellar tract passes to end in an arborization around a cell in the vermis of the cerebellum.

P. is a cell of Purkinji, the axis cylinder process (*P. ax*) of which passes to the cerebro-spinal axis. A dotted line indicates its course towards an ante-horn cell as it has not been clearly demonstrated.

G. M. is the gray matter continuous from spinal cord to optic thalamus through which pain impulses travel upward.

Arrows indicate course of nervous impulses.

ways include in the outgoing neurone, its peculiar termination usually in a muscle or a gland and known as a nerve-ending, and with the ingoing or afferent neurone, its termination within some peculiar modification of the peripheral epithelium, the whole constituting the so-called end-organ. As the particular result brought about by the efferent or out-going neurone, is due to the stimulus applied to the afferent or in-going neurone through its end-organ, it will be seen that the entire process begins and also ends at the periphery, as distinct from the centre or site of the neurone bodies. We might, therefore, speak of the reflex as a circular reaction.

Considering that it is impossible to conceive of protoplasm except as in some environment, and as it is equally impossible to conceive of this sensitive stuff but as being in some way affected by that environment, we would naturally suppose that in a well ordered state of affairs there would be a differentiation of function advancing towards higher specialization, and that there would be a corresponding anatomical provision to meet this progress. Such we find to be the case and this reflex mechanism is nature's provision for a sure and sufficiently speedy response to the action of the environment; an organism that cannot so answer, must suffer, possibly perish.

The fact that we are here to-day after having been exposed from say twenty-five to seventy years to perils without number, is not due chiefly to our forethought, or the forethought of parents, friends, or even philanthropic railroad, steamboat or street-car companies, but to arrangements— from one point of view very simple, from other points of view very complex; and that, among other things, I shall now endeavor to show in some detail.

All these functions which are concerned with nutrition, in the widest sense of the term are reflex. It is true that you may take a horse to water but cannot make him drink, but when once he has started the process of drinking it is from beginning to end reflex— independent of volition. A pigeon wholly without its cerebrum, which all will agree is essential to volition, will drink when its beak is dipped into water, and as is well known, a man quite unconscious will swallow what is placed on the back of his tongue. The outflow of all the digestive secretions is due to reflex action; the movements of the various digestive organs are not voluntary but in the main at least reflex, the only question being to what extent they are dependent on qualities of the muscle concerned apart from the nervous system.

Even a function of such vital importance as the maintenance of a regular temperature is not, in a warm blooded vertebrate, dependent on the direct influence of the circumambient air, as is largely the

case with cold-blooded animals, but is due to regulation by the nervous system of a reflex kind. When we speak of a "bracing" winter day, we mean physiologically one that causes our heat-regulating mechanism to respond successfully to meet the conditions of the case. This is not the whole story of course; in fact the reflexes involved in such a vast variety of effects as follows from a "bracing" day are very numerous as it would be easy to show did time permit. The most that a cold-blooded animal can do in weather that is too hot or too cold is to betake itself to a more favorable environment. The frog seeks the shelter of moist leaves, grass, etc., or sinks into the depth of the pond in warm weather, and when it becomes unduly cold it must either hibernate or perish. Hibernation is, in fact, a provision for preventing the extinction of the species. But warm-blooded vertebrates can in large measure defy changes of temperature. Professor C. J. Martin, of Melbourne, has recently told us that an Echidna in his possession hibernated for four months during the winter with a bodily temperature only ½° C. above the shed in which it was kept. He demonstrated that Echidna is lowest in the scale of warm-blooded animals. These attempts at homœothermism fail to the extent of 10° C. when the environment varies from 5° to 35° C. Ornithorhynchus is a distinct advance on Echidna. In other words, we have in these animals intermediate stages in the development of homœothermism or the power to maintain an equable temperature, *i.e.*, we have an illustration that there has been a process of evolution in this all important function of heat regulation.

All the various forms of locomotion are essentially reflex. The decerebrate pigeon flies quite well, and the frog without its forebrain leaps and swims, while the dog from which Goltz removed the whole cerebrum, had good powers of movement, all of which seems to show that volition, in the ordinary sense of the word, is not essential for locomotion. The pigeon and frog operated on as indicated above, do not, however, fly or leap spontaneously; they require a stimulus—the pigeon to be thrown into the air, the frog to be pinched.

We may ourselves walk a whole block utterly absorbed in thought and absolutely unconscious of the fact that we are walking at all, proving that our will is not in operation, though it or some equivalent stimulus is essential at the outset to initiate the act. Volition is the motorman that starts and stops the machinery. That condition of muscular tissue, whether striped or unstriped, everywhere present in a healthy condition, known as *tonus*, and giving a sense of resistance to touch so pronounced in the healthy young athlete and so wanting in convalescents, the aged, in some of the insane, and in those affected with many other forms of disease or of defective vitality, is undoubtedly due

to reflex action. If in the frog the sciatic nerve be cut or the corresponding posterior roots severed, by which in the one case the out-going in the other the in-coming nerve impulses are cut off, the limb affected tends to become limp and hangs lower than the other, illustrating loss of *tonus*. The same loss of tone can be seen in the human face in consequence of weariness or of depressing emotions. We can truly become "down in the mouth," and many a man after a day of fatigue and worry looks years older because of the consequent diminution in the mus-

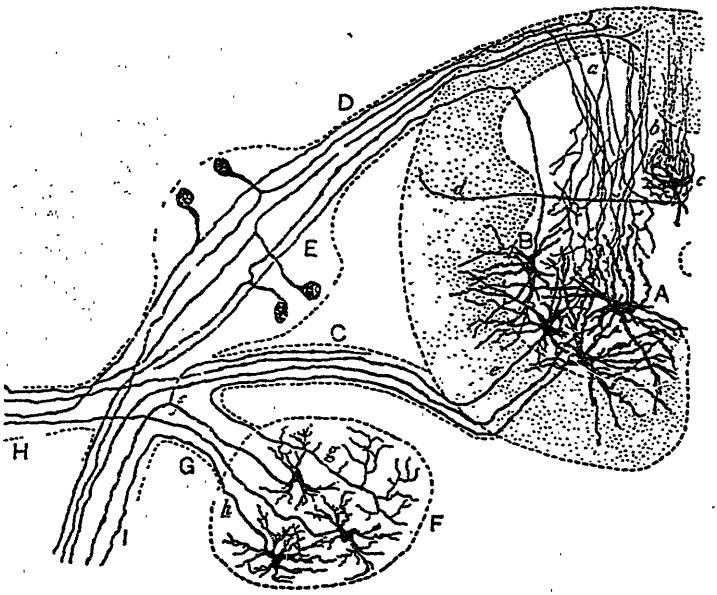


FIG. II. TRANSVERSE SECTION THROUGH HALF-SPINAL CORD SHOWING THE GANGLIA BY GOLGI'S METHOD. (Halliburton after Ramon y Cajal.)

A, Anterior cornual cells, B, axis-cylinder process of one of these going to posterior root; C, anterior (motor) root; D, posterior (sensory) root; E, spinal ganglion on posterior root; F, sympathetic ganglion; G, ramus communicans; H, posterior branch of spinal nerve; I, anterior branch of spinal nerve; *a*, long collaterals from posterior root fibres reaching to anterior horn; *b*, short collaterals passing to Clarke's column; *c*, cell in Clarke's column sending an axis cylinder process; *d*, to the direct cerebellar tract; *e*, fibres of the anterior root; *f*, axis-cylinder from sympathetic ganglion cell dividing into two branches, one to the periphery, the other toward the cord; *g*, fibre of the anterior root termining by an arborization in the sympathetic ganglion; *h*, sympathetic fibre passing to periphery.

cular tone, and this is characteristic of age, for the best, fullest life of muscle is of short duration. The swelling importance of the middle-man that comes with ripening years, is not to be regarded as a sign of physiological well-being, though it may be associated with worldly prosperity. It cannot be explained alone by a plentiful supply of sustenance and a plentiful lack of exercise leading to accumulation of

fat, but must be referred largely to loss of tone in the abdominal and visceral musculature and is weighty evidence of functional decadence.

We speak properly of the tone of the various sphincters of the body, and few physiologists will be found to maintain as formerly that this tone was due to a purely automatic or independent activity of centres in the spinal cord. It is practically impossible to reconcile such a conception with the facts. We must now bear in mind that it has been shewn that the very contraction of a muscle gives rise to in-coming impulses which must tend to complete the circuit for reflex action.

Moreover, all those mechanisms which protect the sense organs of the body, the various look-out stations, so to speak, act unquestionably reflexly. Winking and the secretion of tears (when not crocodile ones), the movements of the ears, as I have witnessed many times in individuals sitting in front of me at a concert, sneezing, etc., are reflexes. The internal mechanisms of the eye, both for accommodation and the changes in the pupil, are only in the most indirect way voluntary.

When the in-coming impulses from below by way of the vagi are cut off from the respiratory centre in the medulla oblongata, its action is seriously impaired, and when withdrawn from above also by removal of the brain anterior to the bulb, there results only a miserable spasmodic action, a gasping or sobbing rather than anything worthy the name respiration.

So thoroughly reflex is the action of the vaso-motor centre that though we speak of this region of the brain sending out tonic impulses, we no longer think of this function as absolutely independent of the in-coming or afferent impulses; on the contrary, one of the classical experiments in physiology consists in showing that the stimulation of the chorda tympani, by which we produce dilation of the vessels of the submaxillary gland, is an imitation of the effect of the introduction of food into the mouth except that we act on the out-going limb of the reflex arc instead of the in-going one.

A good many acts that have become almost wholly reflex were originally as purely voluntary. We have only to watch the efforts of the child in learning to walk to be aware of the fact that the facility which it shows in carrying out this complicated act after a few weeks has only been attained after thousands of efforts affected by the best will-power it could command. Yet the adult is hampered, rather than aided in walking when he attempts to guide each step by volition.

In learning any new thing requiring muscular co-ordination we endeavor to pass as rapidly as possible from the voluntary to the reflex stage. Those of us who cycle can remember with amusement our

painfully willed and anxious efforts with many defeats, and how at length they passed into actions as purely reflex and unconscious almost as breathing. The conversion of voluntary into reflex actions means passing to a higher plane because it leaves the organism free to use its will-power for new attainments, or in that necessary control which the physiologist terms inhibition and by which alone reflexes are made safe, for reflexes without inhibition are like the railroad train without brakes. An organism with perfect reflexes and adequate control is functionally a relatively complete and finished mechanism.

Sometimes, however, a reflex itself is inhibitive. We have a beautiful example of this in the mechanism for the movement of the limbs. The in-going impulses from the biceps when contracting result in a relaxation of the triceps, that is to say, a marked diminution of its *tonus* brought about reflexly. Inhibitory centres have for some time been known to exist in the cerebral cortex. The subject of inhibition, so closely allied to reflex action, is of vast importance, but has been so recently admirably discussed before you by Professor Lombard, that I shall not pursue it at length.

Most of the world are accustomed to maintain that their ears and their eyes have little connection, in fact, that they are functionally as far apart as the poles. But not only does observation show that they are nearer neighbours than they seem, but that they frequently if not constantly work together for the good or ill of the organism, mostly the former. When we turn the head or the eyes in the direction of a sound we imagine that this is done voluntarily, but a reference to two cases that came under my observation during the recent oral examinations in Psysiology at McGill, will show that a connection of the kind in question exists of a purely reflex character.

A small gong fastened to a wooden upright, about 8 feet from where a student was standing facing me, was being used to mark off sharply the time limit of the examination. I was seated on a line with this gong, and, in the one case, the moment it sounded the student's eyes both seemed to fairly jump to the right in the direction of the sound, reminding me of the bolting of a team of horses across the street from fright caused by a loud noise. In the other case, a student in the midst of his answers suddenly turned his eyes, and to some extent his head, to the left towards a canary that was singing loudly at the time. Now, both these students were engaged at the moment in answering questions, and it was impossible that the movement referred to could have been voluntary. It is said that a deserter has been detected on the deck of a ship by shouting to him as he walked away from the observer, "Halt! Right about Face!"—the command being obeyed. Whether the story be true or not, it certainly rests on a good physiolo-

gical foundation, for we can now explain all this by associated reflex action.

The circus and the theatrical agents who cover our fences, bill-boards, etc., with great masses of brilliant color understand their business, for they cannot take more effective means to entrap us, inasmuch as we turn towards such appealing stimuli in a purely reflex fashion, and even Solomon's direction, "Let thine eyes look right on, and let thine eyelids look straight before thee," may fail to inhibit such a reflex. We as surely look as the moth flies into the flame. It is plain that in general the turning of the eyes or even of the head or whole body towards a source of sound or light would be a great advantage, as say in the case of the whizzing shell about to burst. That the anatomical paths by which the impulses travel should have been so fully worked out is to be attributed to the excellence of the technical methods of the day and to that higher mechanism which is so prominent in man and which is not reflex in the ordinary sense, but which starts and controls the reflex actions which bring about the results that man's higher brain parts initiate; for, without these reflex actions required for carrying out the skilled technique, this would have been impossible, however ardently desired or beautifully planned.

Now, if one surveys the whole of the animal kingdom with the physiological eye, it will be seen that differences so far as movements and their functions generally are concerned, are to be sought chiefly in the extent towards which ordinary processes which are common to all are interfered with by the working of a highly developed brain. A frog and a man tell the same physiological story in substance up to a certain point, then in the case of man, because of his immense cerebrum, begins a new series of volumes; or, to change the figure, there is one physiological melody, but with a vast number of variations, some of them being obviously but variations, others additions, yet the physiologist, like the trained musician, should never lose sight of the melody amid all the variations, and to avoid that with our specialization, even in physiology, it is no easy task.

But, even to-day, Gentlemen, on this one of the high days of your life, the most that you do is to be explained by reflex action as I think I could show in detail did time permit; and if that applies to-day in a strange place under unusual conditions, how much more fully does it hold for an ordinary day in a familiar locality when you are treading in the well-beaten paths of your daily duty. And who will compute the vast gain to us physically and mentally of such being the case—the incalculable saving of energy from lower for higher things, with that economy of will power for the greater things—the higher things—not to mention the emergencies of life!

With our practical tendencies we have been accustomed to lay perhaps undue stress, physiologically, at least, on the out-going limb of the reflex arc. While it must appear that from every point of view the in-going arc or the afferent impulses are of equal importance, and, because this is the case, and because this aspect of the subject seems to have received insufficient attention, I will now ask your consideration of it.

Everywhere, as I hope to show by some lantern slides shortly,* nature has in the higher animals paid the greatest attention to the elaboration of complicated structures in which the afferent limb or in-going axone begins. These constitute the various forms of the end-organs. They represent the receiving telephone, if we may not even say the sending operator, at all events they are of essential importance, for without these the functional result is impossible. Remove the epithelium in which the end organs are found, which happens in blistering, and pain is the only impression possible on stimulation of the surface beneath the upraised cells. Cut the posterior roots and not only are all forms of feeling impossible, all reflex action destroyed, but, as has been shewn recently by Warrington and others, even the motor neurone bodies, that we supposed remained unassailable in their independence, have been shewn to undergo a spoiling process, a disorganization of the finer mechanism of the cell body—a form of degeneration of the staining particles known as Nissl's bodies from which it is possible that the cell may or may not recover—and all because the usual inflow of impulses from the outer world has been cut off.

Long ago it was discovered that it was not good for man to be alone. Now we know, on anatomical and physiological grounds, why this is the case. We get along without our fellowman badly—we do without our fellow-creature, woman, still worse—and the bachelor is a man who starves his soul by closing the doors and drawing down the blinds. He shuts out the afferent impulses of the most important kind, those that through the eye or the ear reach the inner man, and a sort of psychic degeneration or "chromatolysis" is apt to result, and does infallibly follow unless he substitutes other afferent impulses with special care: and it is questionable if this can be adequately done by most men.

I hope, Gentlemen, that I have shewn you new and potent reasons for the existence of an institution as old as the Garden of Eden.

Cutting the posterior roots, or their invasion by disease leads to loss of co-ordination in movement. This is very pronounced also when

* This address was illustrated by seventy lantern slides, and by animals showing the effects of recent ablation of the cerebrum, the cerebellum, the semicircular canals on one and on both sides, and also by animals that had recovered very fully from some of these operations.

the in-going impulses that reach the centres by the vestibular nerve are cut off by the destruction of the semi-circular canals, when not only locomotion but maintenance of the erect posture is impossible. The tabetic subject is still more inco-ordinated when the impulses reaching the centres through the eyes are cut off. Ewald astonished us some years ago by showing that destruction of the semi-circular canals leads to a loss of muscular *tonus* with corresponding difficulty in the maintenance of equilibrium. As you will see by the slides to be shown presently, the paths by which the nervous connections essential for the comprehension of this result are now known. So that we may say that the tone of muscles, the maintenance of equilibrium, successful progression, as well as much more of vital importance to the organism, is absolutely dependent on these impulses that reach the centres from divers paths, the relative importance of which is probably different in different species of animals and in different individuals. We are all aware by experience of variations in our physiological condition caused on the one hand by the excitement of a large city, and on the other by the calm of the country, but the cause of this has perhaps not been adequately considered. When we think of the multitudes of stimuli that act on the eye alone in a single hour in any large city, as we walk the streets, and remember that these call for a constantly changing action of both the intrinsic and extrinsic muscles of the eye, with the necessity of sundry nervous discharges; that the latter give rise to reflex actions causing expenditure of energy by all the muscles of the body to a greater or less extent; when we add to this a corresponding effect through the ear, owing to ceaseless noises so that we are exposed to a veritable fusilade of sounds; and when we take into acount the effects of very varying and often, in these days excessive light stimuli falling on the eye; when we reckon with the concussions from hard pavements, etc., without any other considerations, such as the necessity for sudden movement and sudden inhibition of movement with the constant use of not one but all the centres implied in such matters as "catching a car" or avoiding one or perhaps several, is it not possible and easy to understand why people these days incidently seek refuge like hunted animals from the abovementioned enemies of physiological peace and harmony by residence in the suburbs, by ever lengthening or more frequent vacations, by giving up a large part of Sunday to rest if not to sleep, etc. And, if insanity is really on the increase, herein must we seek for a part of the explanation at least, that is in those uncounteracted, irregular, excessive stimuli; or, as I would now express it, in afferent impulses that are too numerous, too frequent, too varied or too powerful. Contrast with this the soothing effect of the few but large stimuli that pour

in on us like a gentle rain, from a broad but somewhat varied landscape while there is no war between the senses because of jarring noises, flashing lights, etc. In other words, when the centres are affected by stimuli such as are favorable to that general but not too active functioning of the body, when all things go on well because the functional pace is not too hot nor too changeable.

Without afferent impulses we pass into unconsciousness, as is illustrated by the oft-cited case of the boy with one hearing ear and one seeing eye, who, when these were prevented from functioning, fell asleep. And with a certain kind of afferent impulses we may become mad.

The beneficial effect of change of scene and climate is to be explained chiefly through the senses—the afferent impulses. The centres must have impulses, as has been shewn experimentally, or they either atrophy or degenerate, and these must be variable but all within due bounds and according to the laws that I suggest would be well worth the study of all and not least by those who have to do with the insane. Psychiatrists have already recognized practically the necessity for varied forms of work and especially of amusement in the treatment of the insane. To put it scientifically it has been shown by the experience of institutes for the insane and others, that systematic exercises in which rhythym or regularity in in-coming and out-going impulses are prominent, have been followed by beneficial results especially in the case of those of low cerebral development. In other words, the brain may after a fashion be built up functionally.

On the other hand, special attention must be paid to the quantity and quality of the afferent impulses as implied in amusements. Nearly all persons, sane or insane, absolutely require to attend to the quality of the influences that affect them through the eye and the ear. Pawlow has shewn by his magnificent experiments that the quantity and quality of digestive secretions vary, not only with the amount of food, but with the surroundings of the subject—the accessories of the food. And experience has taught each of us that at a banquet with its appeals through the eye and through the ear, by music, not to mention other influences, an unusually large quantity of food can be disposed of without discomfort or injury.

The number and kind of impulses best for each individual is varied. The man or woman of artistic tendencies must have the visual or auditory impulses in a larger degree and of a more carefully selected quality than others or they suffer, just as some people would starve on a food supply that amply suffices for others. We may not as yet be able to write prescriptions for our patients with afferent impulses as the *materia medica*, but possibly study along this line would show

that we could make a reasonable approach to it. It would be useless to prescribe afferent impulses through the ear in the form of dance music for the cultivated musician, but this might prove the very best remedy for the wearied, worried or insane ordinary mortal, uncultivated musically; for him a Beethoven sonata would be as caviar to the vulgar.

But a subject like this is boundless, and I can only hope to say enough this evening to indicate some of its possibilities. I can speak but briefly of the psychic correlatives. All along you will observe I have been assuming that there are psychic equivalents. Although the in-going impulses favorably affect the centres quite independently the ingoing impulses favorably affect the centres quite independently of consciousness, they are divisible, speaking generally, into two classes —those that produce or are associated with subconscious reactions only, and those whose effects come into the field of consciousness to a greater or less extent. Both are, no doubt, attended by functional changes and the subconscious in our life will bear far more study both physiologically and psychologically than has yet been given it. It will be agreed that reflexes and instincts are closely allied if not correlatives. Even the most original thinker, the most versatile writer is a creature of reflexes, otherwise the statement that each has his own style would be of much less force. Do as we will, we cannot escape the effect of habit, of psychic as well as physical habit, if I may so express myself, for bodily habits are little else than associations of reflexes more or less complex and these have their psychic correlatives.

Once having written or spoken on a subject we tend to fall on the next occasion into the same manner of expressing ourselves. The mass of mankind must be imitators because no new dominant ideas, as in the case of the genius, break through the force of mental habits and inhibit the mechanism, psychic and somatic, which repetition has formed and welded into often complex wholes. It is literally true that the souls of most people are made for them, that is their quality determined by their environment. The afferent impulses act on nervous centres and are associated with all the phases of consciousness in a way we recognize but cannot fully understand or explain. It is true that the resultant product can be explained neither by heredity nor environment—neither by the nature of the centres nor by the nature of the afferent impulses—but only by a consideration of both; and these factors are variables to be determined by the study of individuals. On the one hand we have the physical man kept from being a mere mechanism answering like a jumping-jack to the play of afferent im-

pulses by physiological inhibition with its psychic equivalent which we term volition; and while every thoughtful man must feel that we but imperfectly understand either, yet we may hope that we are getting nearer to an explanation.

Some investigations that I have been making on pigeons with more or less of the cerebrum removed, have been highly instructive to me in this connection.

Man differs from the lower animals by the variety and richness of his psychic associations. The child of a few years has more numerous psychic associations that the most intelligent dog, and he has a cerebral development of a neurone complexity corresponding to this. But limit the afferent impulses, confine both under an identical and simple environment and the dog and the child will come nearer together psychically. Modern civilized life is full, probably too full, of afferent impulses; they should be regulated. How to keep all that are good in themselves, how to maintain sufficient richness in variety and turn these to account for the best development of the sane and the best management of the insane is, I venture to think, to state some of the physiological, psychic or educational aspects of the subject in broad terms—to claim that it is the whole would betray a narrowness which enthusiasm could not excuse.

I have in this address made no allusion to a large class of afferent impulses derived from the viscera, etc., and giving rise to the organic sensations, and which, unquestionably, plays a large part in that feeling of well-being or its opposite with which all are familiar. These impulses, no doubt, greatly influence if they do not originate emotions. The subject is important, but I can the better omit further reference to it as I find that one of the members of the Association, Dr. Cowles, is to treat of "The Organic Sensations in Mental Pathology."

To sum up the whole discussion, we may say that practically all the functions of even the highest animals are in whole or in part reflex; that the purpose of volition is chiefly to imitate or to regulate or inhibit reflex action; that most of such reflexes are carried out with great economy of energy and largely unconsciously; that instincts and habits are in some measure the psychic correlatives of simple and associated reflexes; that man differs from other animals in the degree to which he can control those reflexes and their psychic correlatives, rather than in any fundamental difference of nature so far, at least, as the subject under discussion is concerned.

ADDRESS TO THE GRADUATING CLASS IN MEDICINE, 1902.

BY

C. F. MARTIN, B.A., M.D.,

Assistant Professor of Medicine and Clinical Medicine, McGill University; Assistant Physician to the Royal Victoria Hospital.

Having, after four successive years of steady application, attained to the distinction implied by the title you have just received, the congratulations of the Faculty and your other friends are quite in order.

Although it be true that you are but recent graduates, yet this indicates a very wide, though, perhaps, superficial knowledge of the various branches of Medicine, and it rests with you to recognize that such facts as you have now acquired *are merely* knowledge, which, after all, is, but *one* of the many qualifications of the complete physician. Knowledge alone does not necessarily imply a keen insight into human nature, a due appreciation of one's surroundings or a proper judgment; in other words, the practitioner will soon learn that he must add to the science of Knowledge the art of Wisdom—an art which cannot be taught in a college curriculum nor crammed up in a few months or years, coming rather of itself spontaneously to those who observe patiently and carefully and honestly for years, and who profit by their many experiences.

The boy George, some one has said, may explain to his admiring father the merits and intricacies of his new rifle—any scientific improvement the youngster may teach his governor—but don't let him go further and attempt to instruct him in the art of finding and bagging his game. In Medicine, as in hunting, such an error easily occurs unless the neophyte ascertains in due season that the greatest of wisdom lies with those who appreciate their own ignorance and who have a proper sense of humility and awe in approaching any profession, or when standing on its threshold.

In welcoming you as colleagues in the pursuit of an honorable, dignified and noble profession, one might be tempted to say much of the duties of the physician to the public, to his patients and to the profession—of his opportunities to be helpful, sympathetic and unselfish, of the necessity for care in the diagnosis and treatment of the cases under his charge, and, above all, of the great need, too often overlooked, of more of the milk of human kindness in practising a profession which has for its object the maintenance of human life. But all of you in your daily hospital duties have long since realized

wherein your power for good may lie—nor need you do more than emulate the example set by your own late Dean, who, having laid aside the emblems of his office, is now taking a much needed rest, retaining the respect of his colleagues, the admiration of the people and the lasting affection of all his patients.

Coincident with the resignation of Dr. Craik came the appointment of his successor, our present Dean, Dr. Roddick, than whom none is more popular and in sympathy with both colleagues and students, and to whom we are so much indebted for his efforts to promote the interests of Canadian medical education. I cannot resist the temptation to quote just here from the valedictory address he delivered to my own graduating class ten years ago:

"Gentlemen," he said, "the profession of your choice is an arduous one—and full of responsibilities. It likewise demands from its members the greatest devotion and a large share of self-denial. On the other hand, there is no calling which, in itself, tends more to elevate and refine its followers—nor in which one's life can be made so useful. And what greater gift than that of daily usefulness to one's fellow-creatures?"

Were I to select one feature wherein the incipient physician may to-day achieve the greatest public good, I think I would say that in the propagation of *intellectual honesty* lies his best opportunity for doing good to the profession and the world at large. Thanks to charlatans, on the one hand, and to not over-scrupulous practitioners on the other, people are apt, and with some reason, to question the opinions of medical men and trust to those who are neither entitled nor able to give sound and honest advice. While knowledge is constantly more diffused as civilization advances, wisdom does not always keep it company. There is a widespread curiosity on the part of the public to know and discuss matters medical, even though unable to appreciate to any proper extent the nature of the subjects under consideration. Having tasted of the Pierian spring they have neither time nor desire to drink deeply, but are ready non-the-less to recommend, as with authority, this or that method of treatment—this or that drug, doctor or appliance. Some will advocate the mind cure alone, or special varieties of massage, because their friends were thus most marvellously cured, forgetting the while that mental repose and massage—which are the fundamental bases of these lines of treatment—are methods which belong to every medical man's armamentarium, and when practiced by irregular individuals are the only germs of truth in such glaring misrepresentations.

It thus happens that between the conscientious physician and the irregular unlicensed healer this difference exists—that while the

former is rational in his method of treatment, modest in his appreciation of what medical skill can do, and honest in his assertions of its present limitations, the mental healer openly avows his ability to cure all human ills, be they cancer, locomotor ataxia, or general paralysis of the insane, provided, of course, that the case be seen in time!

Others, again, believe in no doctors whatever, either because medical science is so often fallacious, or because something higher than reason—the inner consciousness—tells them that medicine is unnecessary, and that there is really no such thing as illness. A serious malady with perchance a fatal result is at times their only and bitter lesson.

Curiously enough, on the other hand, some of the public think a physician should possess a specific remedy calculated to alleviate or remove every physical ailment to which our bodies are liable, and, having failed to gain relief, in their unreasonable disappointment at the profession at large, they will resort to the information afforded by the daily press, seeking out some of the nostrums which they read are most certain of healing all diseases. Their failure to obtain relief is hushed up for very shame; a possible cure, previously unattained on account of the relatively incapable physician and due now, perchance, to time and nature's beneficence, is lauded to the skies as a triumph of the newer method, and charlatanism thus runs riot.

Would you duly offset the evil influences here mentioned, it is first of all essential to be honest yourselves—to acquire a reputation for truth, not only in your statements and opinions of a case, but, likewise, for common honesty in your prescriptions—giving medicine only where needed, operating only where no other means is so satisfactory—and, in fact, in all you say or do, to be known as sincere, conscientious and severely truthful. It rarely chances that a physician would do better to conceal the truth, for, with sufficient tact and due sense of the fitness of his surroundings, he is enabled to make a patient bear with complacency truths which might otherwise be most trying and unpleasant to hear.

To fortify your position in the community still more, it is essential that the public should respect the profession of which you are a member—that they should find in their physician one who has a liberal education, with culture and refinement in his tastes, dignity and a proper self-respect evident in his manner and speech—an appreciation of human nature and a desire to be an exemplary man to those in his community.

Let us, therefore, plead for a better use of leisure hours, for an interest in matters outside of our profession, wider collateral reading, more of art, music and travel—and all those features of education

whereby as individuals we may raise the standard of the guild to which we belong.

To some of you the good fortune will come to be residents of hospitals, here or in some other parts of the country, and thereby you will acquire in a short time an invaluable experience—testing your ability to get on with your neighbours and gaining that confidence in your own opinions and methods which is so difficult to acquire under any other conditions. To all, however, let the suggestions be repeated, that the temple of knowledge resting on the dim and distant heights is only to be attained through the long and winding pathway of humility, and happy is he who, conscious of his own infirmities, is willing to look about him ready to learn from others the road he too should pursue. Nowhere as in hospitals are reputations so quickly made or marred for those who are on the threshold of their career.

Failing to gain the coveted hospital appointments (for though many be called, few are chosen), an excellent alternative exists in a visit to the celebrated European clinics. Indeed, no one having such an opportunity should neglect to avail himself of it in the early years of his professional life—and as often thereafter as is expedient. While there can be no doubt that our progressive neighbours in the South may grant equally good facilities for study in many of the branches of Medicine, there are other and collateral interests which make a European trip still more profitable and commendable. By realizing beforehand along what lines the student intends mainly to devote his efforts much time will be saved, and by arranging before his departure for opportunities to continue similar studies on his return, the European teaching will be all the more valuable and appreciated.

Many of you, again, will enjoy the enviable existence of a country practitioner—enviable in truth, implying as it does a unique position in the community, where, as a family physician, you occupy a place which in the larger towns is passing all too quickly away. The freedom from the turmoil of the more strenuous city life—the opportunities for mental repose and a congenial and useful unostentatious existence, are not greater in any other profession, and compensate in no small degree for the long and weary midnight rides, the grave responsibilities when aid is not by, and the comparative intellectual isolation.

Situated under such conditions and spreading goodness wherever you go, there is little need to lament the part you are taking in the advance and progress of medical science. It is given to very few to become truly scientific workers—to devote their time usefully to elaborating the various problems in medicine which will be of value

in curing and preventing disease. Of the hosts of men at work, and those who, though not at work, are writing, very few are capable—the result being that much of the current medical literature is worse than useless, rendering it difficult for the recent graduate to sift the vacant chaff from honest grain. Experimental research is by no means a necessity for every physican—but rather a pursuit to be indulged in according to one's leisure and opportunities. If you do not, therefore, feel enabled to devote ample time to the work and have not the eagerness to persist, by all means keep out of it, and you will confer a boon on your colleagues and a benefit to the profession.

In meeting now for the last time together, your teachers wish you all prosperity and would remind you that success does not imply wealth or even a lucrative and influential practice. Rather let it be said that to acquire this at an early stage in your career is more to be lamented—preventing you from keeping abreast of medical advances and causing your talents to arrest in their development, and your education ten years later to have suffered in the extreme.

To be successful as a physician you must gain the respect of your colleagues, be devoted to your profession and render unto it the great debt you owe it—not standing still mentally, but using every hour to some purpose, realizing that "the bird of time hath but a little way to fly, and lo! the bird is on the wing."

THE OVARIAN VASCULAR CIRCLE.

BY

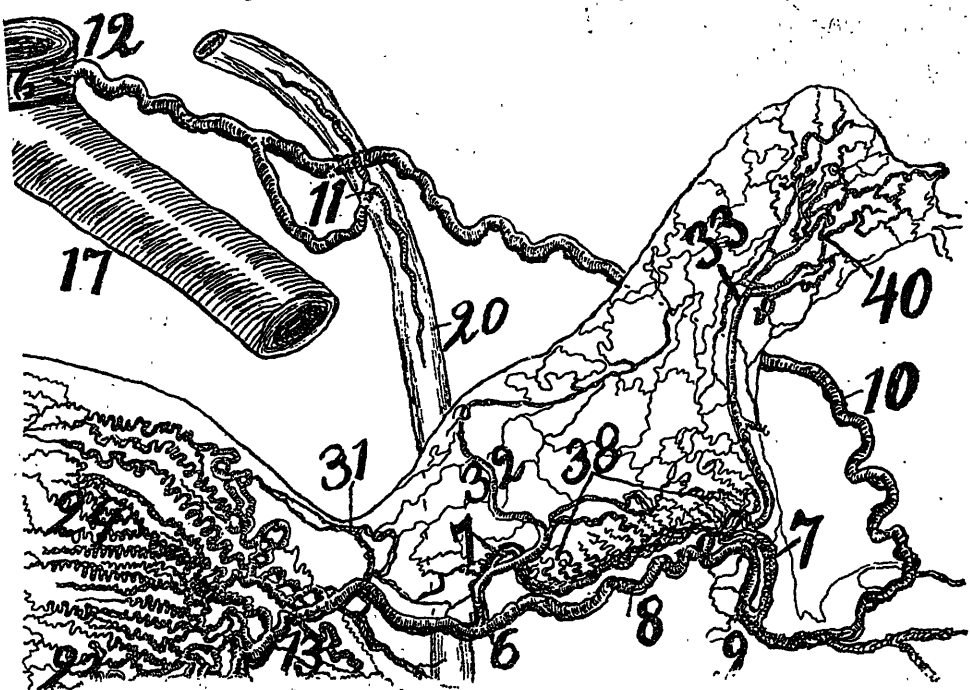
BYRON ROBINSON, M.D, Chicago.

In this article attention is called to the almost constant macroscopic vascular arterial circle or vascular oval found in the mesosalpinx and ligamentum latum. It is formed by the ramus oviductus medially (proximally) and ramus ovarii externalis (distally) which converge laterally at the oviducal pavilion and medially at the utero-oviducal angle while the branches may be widely-sepearated in the centre of the vascular circle. The periphery of the ovarian vascular circle, *i.e.*, the ramus oviductus and ramus ovarii may lie practically parallel or pass over each other. This ovarian vascular circle prevails generally among lower animals. The ovary, is the central organ of this vascular circle.

DRAWN FROM AN X-RAY OF THE OVARIAN VASCULAR CIRCLE OF AN INFANT ONE DAY OLD.

Fig. 1 (Author). The subject was injected with starch and red lead, and an X-ray taken in Dr. Pratt's X-ray Laboratory. The bilateral ovarian vascular circle, 6, 8. 9; 6, 7, 9; 9, 10, 11 the ovarian segment of the utero-ovarion artery. (Figure 7 should be placed on the ramus ovarii midway between 6 and 9. 1, 2, 3, 4 pelvic floor segment; 4, 5, 6 uterine segment; 6, 8, 9—6, 7, 9 the oviducal segment which is the ovarian vascular circle. 50 anastomosis between utero-ovarian and renal artery.

In some cases the circle is 6 to 8 inches in circumference which is composed of the ramus oviductus and ramus ovarii each being 3 to 4 inches in length. The oviducal segment is practically a vascular circle, however, oval-shaped in the living. This vascular circle begins at the utero-oviducal angle, the middle bifurcation of the utero-ovarian artery and ends at the pavilion, the proximal bifurcation of the ovarian segment or the reverse. The circle constitutes practically the whole of the oviducal segment of the utero-ovarian artery.

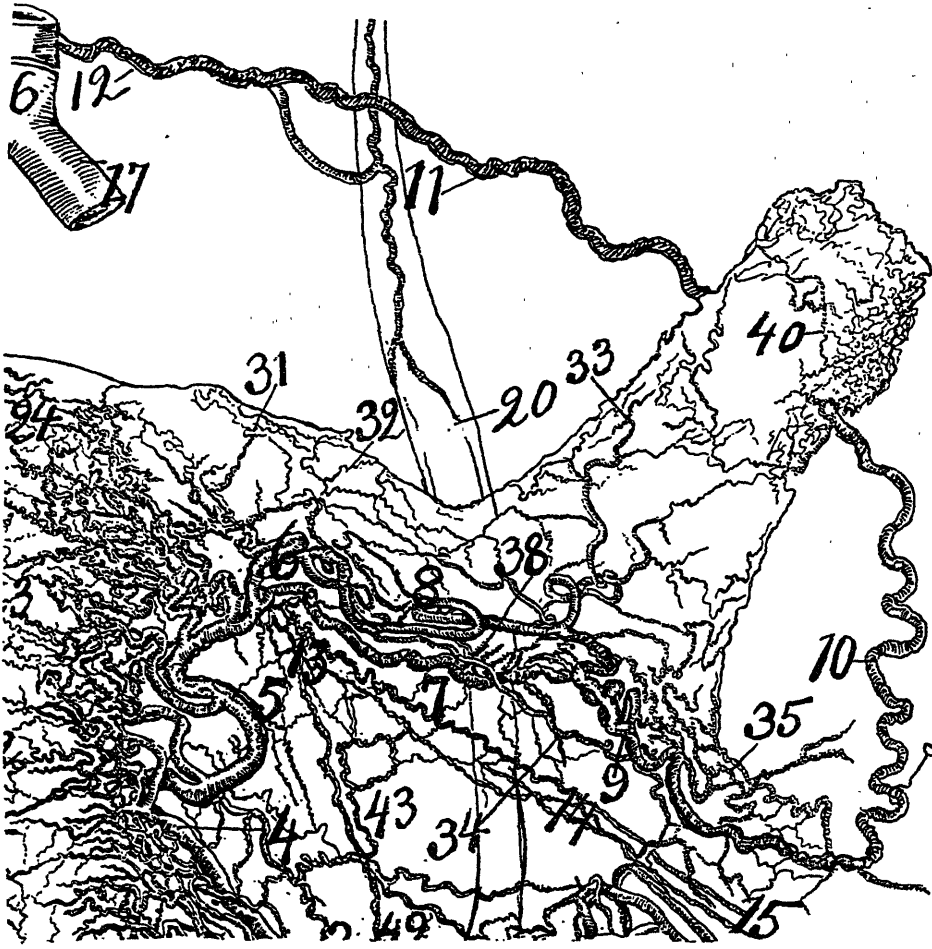


OVARIAN VASCULAR CIRCLE OF A 22-YEAR OLD NULLIPARA.

Fig. 2 (Author). Drawn from an X-ray taken in Dr. Harry Pratt's X-ray Laboratory, 6, 7, 7, 9 and 6, 8, 9 the ovarian vascular circle; 9, 10, 11, 12 ovarian segment; 6, 7, 7, 9 ramus ovarii (with some 8 rami laterales ovarii); 6, 8, 9 ramus oviductus (with 3 rami laterales oviductus); 20 ureter; 24 fundal arteries.

The oviduct or ovary can be removed without severing the ovarian vascular circle by clipping the mesosalpinx close to the oviduct or the mesovarium close to the ovary. The ovary is the central organ of this vascular circle and is fed by the long helicine arteries from th ramus oviductus and the short helicine arteries from the ramus ovarii emitted from the periphery of the circle. This should, therefore, be called the vascular circle of the ovary as it lies in the centre and is fed from the peripheries.

The oviducal segment has the shape of an arterial elipse, a vascular circle, from the periphery of which emerges lateral branches to supply the ovary oviduct and adjacent structures as the mesonephros, mesometrium. The oviducal segment divides practically into three branches to supply the oviduct (rami laterales oviductus), ovary (rami laterales ovarii) and round ligament (ramus ligamenti teritis. The mesosalpinx and mesometrium and mesonephros being supplied by



OVARIAN VASCULAR CIRCLE.

Fig. 3 (Author). Parous woman, 30 years old. Drawn from an X-ray taken in Dr. Harry Pratt's X-Ray and Therapeutic Laboratory. 6, 8, 9—6, 7, 9 the ovarian vascular circle; 6, 7, 9 ramus ovarii (presenting 4 rami laterales ovarii), 6, 8, 8, 9 ramus oviductus (with 3 rami laterales oviductum), 9, 10, 11 and 12 ovarian segment, 4, 5, 6 uterine segment, 13, 14, 15 round ligament segment, 20 ureter, 40 rich vascular net work adjacent to ampulla and pavilion.

fine lateral branches, rami ligamenti lati and rami mesonephros. The uterine and oviducal segments generally form a right angle with each other at their junction, near the origin of the round or ovarian ligament.

Of the three almost constant branches of the oviducal segment the ramus ovarii is most spiral and looped, is much longer than the distance between its origins, while the ramus oviductus is scarcely spiral at all at its distal end, slightly flexuous, but not looped, at is proximal end. The branch of the round ligament is very flexuous and spiral and in pregnancy is looped apparently four times its length during the resting state. The location of the division or middle bifurcation of the uterine segment into the oviducal segment is very variable. The oviducal segment furnishes the artery to the oviduct which courses in a spiral state horizontally laterward between the blades of the mesosalpinx and emits the rami laterales oviductus.

Branches of the Ovarian Vascular Circle.

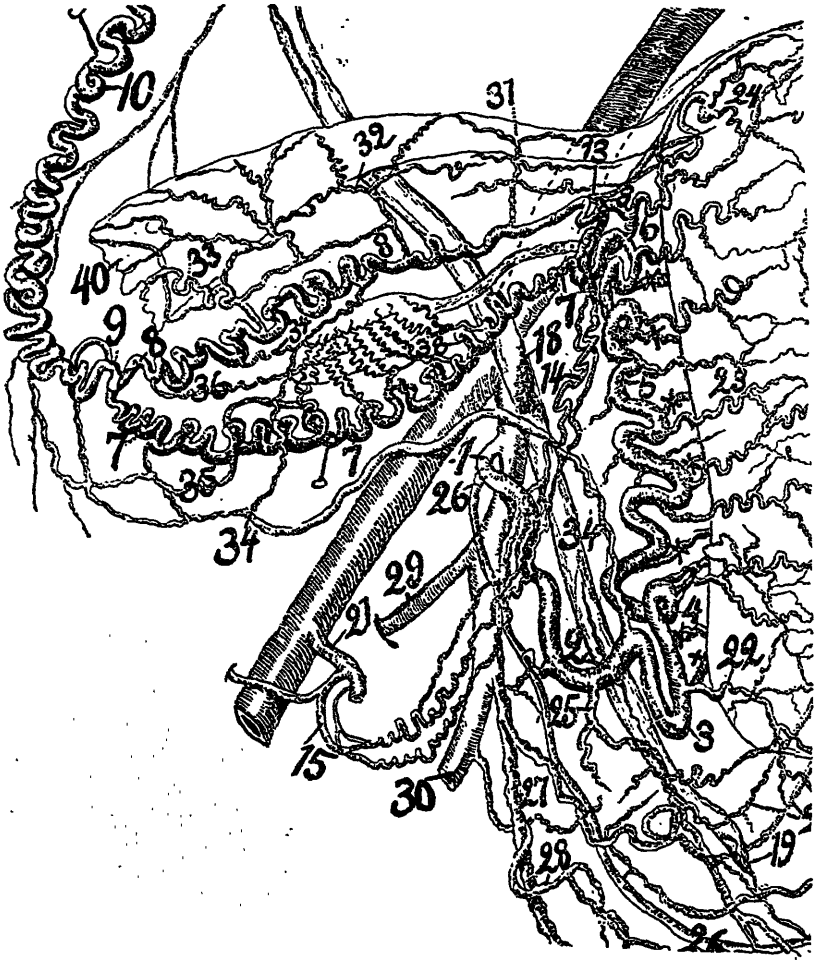
Helicine Arteries.

a. The long helicine (rami laterales ovarii longi).

The ramus oviductus may send two or three lateral ovarian branches (long helicine) which are longer than the short helicine from the ramus ovarii. The long ovarian helicine arteries from the ramus oviductus to the ovary at the first arise as non-spiral until they approach the external pole of the ovary. The long ovarian arteries (helicine) from the ramus oviductus stand in contradistinction to the short ovarian (helicine) arteries from the ramus ovarii. In the child I have found 3 long non-flexuous arteries from the ramus oviductus to the ovary. The long helicine arteries (3 generally) from the ramus oviductus show some spirality but chiefly flexuosities. Besides the general half-dozen short helicine arteries destined for the ovary from the ramus ovarii and the generally 3 long helicine arteries destined for the ovary from the ramus ovarii I found irregular branches not exactly alike in each individual, supplying the extra ovarian arches. These irregular branches may make one or more arcs and arcades, in the ligamentum latum (see chart Nos. 34 and 35). I found similar irregular loop arcs and branches in the cow, dog, cat and rabbit.

b. *The short helicine* (rami laterales ovarii brevis).

The short helicine arteries (generally 5 to 7) arising from the ramus ovarii show a marked spirality. Both long and short helicine arteries converge as they approach the ovary. They divide dichotonously. The cow shows 5 short helicine arteries from end divisions of the ova-



OVARIAN VASCULAR CIRCLE DURING GESTATION.

Woman pregnant 3 months.

Fig. 4 (Author). Fig. 3. A dissection of the right side. I injected it in situ with vermilion and celluloidine, after which I carefully dissected it under alcohol. The prominent factors are the distal arterio-ureteral crossing (2) arterio-ureteral loop (2), the cervical loop (3), which was exactly 2 inches long at 3 months gestation, the distal arteria ureterica. The ovarian vascular circle (6, 7-7, 9) (6, 8-8, 9), the rami laterales oviductus 31, 32, 33. The ovarian segment (10); the additional vascular arches, 34, 34, 35 persisting from the Wolffian body. The long helicine (36), and the short helicine (38) arteries passing to the ovary; 13, 14, 15, the round ligament segment; 30, internal pubic; 26, vaginal artery.

1, 2, 3, 4, pelvic floor segment; 4, 5, 6, uterine segment; 6, 7, 7, 9—6, 8, 8, 9, oviducal segment; 6, 7, 7, 9, ramus ovarii (with 5 rami laterales oviductus and 3 long helicine arteries).. (Cut taken from Author's article in the *Am. Gynecol. Jour.*, J., Dec., 1901.)

rian segment. In her the ovary is supplied directly from the ovarian segment without the intervention of lateral branches. The (5 to 7) short helicine arteries (rami laterales ovarii) converge as they pass through the mesovarian to the ovary. The X-rays shows quite regularly 4 to 5 in number in man. The ramus ovarii gives origin to helicine arteries of which the most external anastomose with the ramus oviductus or the ovarian segment. The helicine arteries are practically all parallel. The ramus ovarii founds sub-ovarian arcade which may emit nearly all the rami laterales ovarii.

c. Rami Laterales Oviductus.

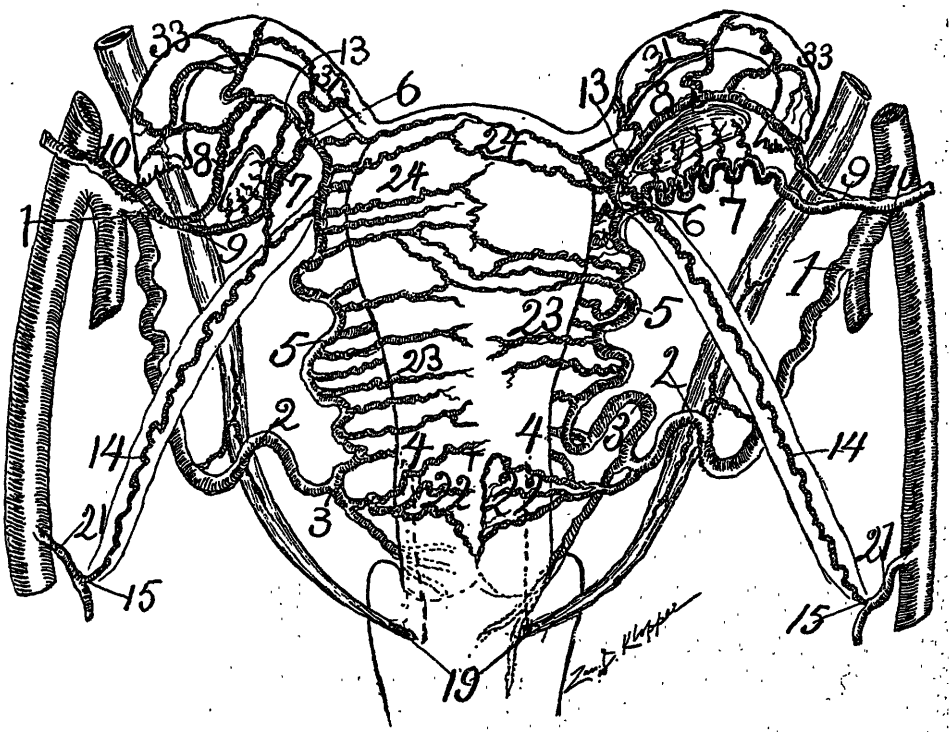
The arteries which supply the oviducts are generally 3 in number, viz.: one large one supplying the pavilion and proximal ampulla. An artery of less dimension supplying the junction of isthmus and ampulla. Finally, a third artery of still smaller size which supplies isthmus oviductus.

d. Extra Ovarian Arcs and Arcades.

In the region of the ovary there exists a variable number of extra vascular arches especially belonging to the ramus ovarii. These extra vascular arches are located in the ligamentum latum and ligamentum suspensoriun ovarii. The ovary is the last organ developed in the Wolffian body, and hence its vascular arcs and arcades are more persistent, consequently, when the important sexual gland, the ovary, passed distalward due to erect attitude, the persistent vascular arcs were transported with it to the lesser pelvis. I shall adopt the term *extra ovarian vascular arcs*, as the most appropriate. The signification of the ramus ovarii in the extra ovarian arcs lies in the fact that it emits the greater number of branches to form the arcs, that the chief anastomoses of arcades is closely adjacent to the same and nearly all of the rami laterales ovarii may arise from the extra-ovarian arcs. As proof that the extra-ovarian or sub-ovarian arcs and arcades are persistent vascular arches from the Wolffian body we can say that the arcs and arcades may be formed by branches from the 5 segments of the utero-ovarian artery, viz.: Pelvic floor, uterine, oviducal, ovarian, and that of the round ligament. The extra ovarian arcs or arcades in my dissections were formed by branches from (*a*) the ramus ovarii, (*b*) from the pelvic floor (segment), (*c*) from the rami laterals ovarli (short helicine), (*d*) from the ramus oviductus; (*e*) from the ovarian segment, (*f*) from the round ligament segment (*g*) from the uterine segment, and (*h*) from the external lateral ovarian and proximal long helicine which forms the extensive vascular net work at the oviducal pavilion. The pavilion vascular net work anastomoses with the extra

ovarian arcs and arcades. Thus the extra ovarian arcs are solidly and compactly bound by anastomoses with every segment of the utero-ovarian artery.

The extra ovarian arcs and arcades may consist of one branch producing one vascular circle or arcades through anastomosis of many branches producing as high as 8 vascular arcades through anastomosis. These arcades are located in the liamentum latum between the ovary and ligamentum suspensorium. In other words, the extra ovarian arcades are located mainly at the junction of the ovarian segment and oviducal segment in the region of the ovary. I shall consider the extra ovarian arcs and arcades as simply additional persistent genital arches from the Wolffian body due to late development and importance of the ovary. They are practically located in the region of the ovary. As the ovary is one of the last organs perfected in the Wolffian body it carried with it distalward to the ligamentum latum the last formed arcs and arcades.



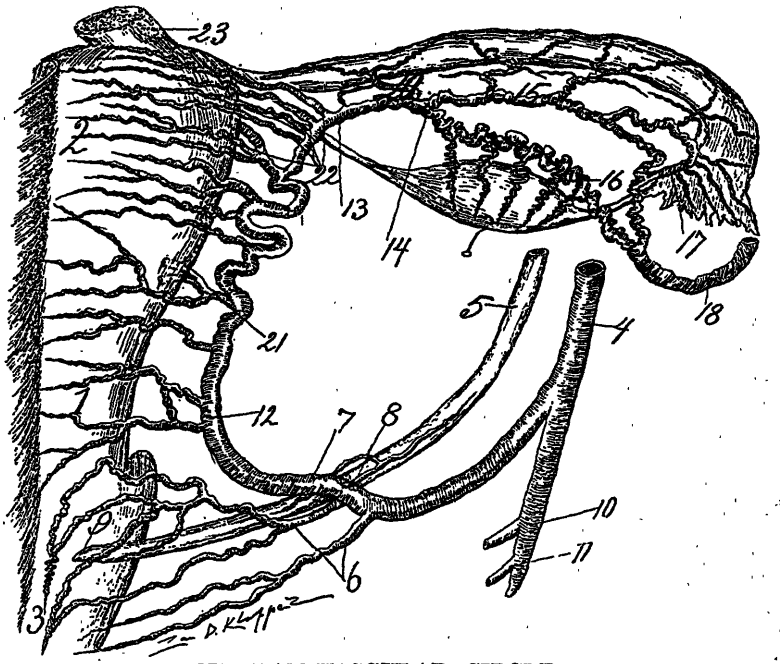
THE OVARIAN VASCULAR CIRCLE.

6, 7, 9—6, 8, 9, bilateral.

Fig. 5 (Author). This was carefully dissected from a woman, 55 years old. There were 3 myomata in the fundus and corpus which accounts for the persisteny of the large rami laterales uteri and large ramus oviductus and large ramus ovarii (6, 7, 9).

The chief branches of the extra ovarian arcades are:—one from the Pelvic floor segment, and one from its ramus ovarii.

The best way to realize the richness of the blood-supply to the ligamentum latum, ovary and oviduct is to inject with red material the utero-ovarian artery of a very spare subject (man or animal) and then hold the injected membrane (better dried) between the eye and the sunlight when a luxuriant blood-supply may be observed. Subsequently, a more wealthy blood-supply may be observed in the same ligamentum latum by placing it after drying, in balsam, when the opaque tissue of the ligamentum will be cleared exposing fields of innumerable fine vessels.



OVARIAN VASCULAR CIRCLE.

10, 15, 17 and 10, 16 the vascular circle, the small hook draws its ovary out of the circle.

Fig. 6 (Author). Woman, abut 55. Front view. I slowly dissected out the vessels drawing them in accurate relations after which Mr. Klapper drew from the plan. A myoma about the size of a pigeon's egg existed on the fundus. The pedicle 23. This tumor made the 5 fundal arteries remain very large. 1. cervico-vaginal; 2. lateral corporeal branches; 3. very large vaginal branches (arteria ozygos vaginæ); 4 hypogastric; 5, ureter; 6, vaginal arteries; 7, distal arterio-ureteral crossing; 8, arteria ureteris; 9, ureteral opening; 10 and 11, branches from hypogastric; 12, exit of cervico vaginal; 13, uterine segment immediately before it divides into the ramus oviductus (15); and ramus ovarii (16); 14, point of division of uterine segment; 17, 20, lateral oviducal branches; 18, ovarian segment; 21, lateral corporeal branch which divides dichotomously sending a branch to anterior and posterior uterine surface; 22, rami fundi. The corporeal and cervical branches were atrophied, the vaginal arteries were not. The fundal branches were enlarged from myomatous irritation.

The X-ray of a well injected spare ligamentum latum shows a luxuriant blood supply superior to all other methods. Spare dogs and other animals show rich blood supply in the ligamentum latum and adjacent structures when well injected with red material and dried. The fine spiral ramifying vessels of the ligamentum latum may be noted coursing parallel and transverse to the surface of the oviduct, resembling those of the enteron and especially converging toward the ampulla and pavilion forming luxuriant and rich vascular net work. The exposure of the branches of the oviducal segment is the most certain with well injected X-ray specimens.

The Ovarian Vascular Circle during Gestation.

In the advanced pregnant state the ovarian vascular circle is large and beautifully distinct. A dissection demonstrates it better than an X-ray. In the illustration of the pregnant subject it is quite distinct. The long and short helicines are large and distinct. The short helicines were well likened to tendrills by Johannes Miller for they coil in markedly spiral states.

Summary in regard to the Ovarian Vascular Circle.

In the vast majority of subjects there is a distinct ovarian vascular circle. The ovarian vascular circle is composed of the ramus oviductus and ramus ovarii. The ovarian circle is practically the oviducal segment of the utero-ovarian artery, and is located in the ligamentum latum and mesosalpinx. The circle begins at the utero-oviducal angle, *i.e.*, at the middle bifurcation and ends at the pavilion, *i.e.*, at th proximal bifurcation of the utero-ovarian artery. In a typical ovarian vascular circle the ramus oviductus emits 3 long helicine, while the ramus ovarii emits 5 short helicine to the ovary. The ovary is the central organ of the ovarian vascular circle which nourishes it by emitting branches from the periphery.

The ovarian vascular circle (the oviducal segment) allows the oviduct to be removed without severing it by incising the mesosalpinx close to the border of the oviduct. The ovary may be extirpated without severing the circle by incising the mesovarian close to the hilus.

THE USE OF HYOSCINE BEFORE THE ADMINISTRATION OF ETHER.*

BY

E. A. ROBERTSON, M.D.

Hyoscine hydrobromate is the hydrobromate of an alkaloid obtained from the plant Hyoscyamus niger, a member of the order Solanaceæ. The other members of the family used in medicine are Atropia Belladonna, Datura Stramonium, Duboisia myosporoides, and Scapolia Carniolica. From these plants are obtained the alkaloids atropine, hyoscyanine, hyoscine, and scapolamine, which have the same formula but differ in molecular structure and physiological action. It has been asserted that the hyoscine of commerce, which is a syrupy liquid, is obtained, as a rule, from Scapolia, and therefore is really scapolamine. Hesse and Merck say that scapolamine consists of two bases, hyocine and atrocine, and as the action of the latter alkaloid is unknown, it is important to know that the hyoscine used in the cases here reported is that made from hyoscyamus.

In man hyoscine hydrouromate produces:—

(1) Dryness of the mouth.

(2) Flushing of the face.

(3) Great drowsiness, deepening into sleep, and sometimes semidelirious muttering and dizziness.

(4) Diminished frequency of respiration.

(5) Diminished frequency of pulse.

(6) As a rule, hydriasis.

The action on the sweat glands, so powerful with atropine, is absent, and sweating is often seen, although I have never observed it in my cases. On the circulation it has little effect, if anything, it is a feeble heart depressant. It depresses the motor cord, but not the sensory areas.

It has been used in insanity, especially acute mania, as a hypnotic, and also as a depressant of the sexual centres in sexual excitement. It is said to have a good effect in the crises of locomotor ataxia.

According to the latest edition of Wood's Therapeutics, no fatal case of poisoning has been reported, though in several cases it has been stated that alarming symptoms have been caused by comparatively small doses of the drug. It would seem from the literature that certain individuals possess an idiosyncrasy to hyoscine as is the case with atropine. The

* Read before the Montreal Medico-Chirurgical Society, May 16, 1902.

concensus of opinion by those who have used it most extensively is that it is not dangerous: one-quarter grain has been taken with no greater effect than a prolonged sleep. The dose is set down as from 1-150 to 1-80 of a grain.

If we can rely upon statistics, ether is a safer anæsthetic than chloroform or any other anæsthetic for long operations. It possesses certain disadvantages, however, which it would be desirable to overcome. In the second stage there is a tendency to delirium and excitement. It produces profuse secretions from the mucous membranes of the nose, mouth, larynx, trachea, and stomach, with resulting obstruction to respiration, decreased ăeration of the blood, and as a result rigidity of the muscular system. During recovery from ether there is often restlessness and even great excitement, and, worst of all, especially after a severe abdominal operation, intense nausea and vomiting.

With the object of preventing or lessening these disagreeable effects, I have experimented with two drugs, chloretone and hyoscine hydrobromate. In the case of chloretone, my results were not encouraging, and I abandoned it. It is possible that I did not give it a sufficient trial. The results from hyoscine have been more favourable, but I wish to state distinctly that my experiments have been few, and that I do not claim that they are conclusive. I simply wish to report the results in my cases, with the hope that others who are in the habit of giving ether will try the drug and report results.

I give 1-100 of a grain of hyoscine hydrobromate hypodermically, one-half hour before the administration of ether. I have given it so far in fifteen cases, in all of which the Clover's inhaler has been used. In general terms, I have found it to produce the following results;—

The patient, half an hour after the injection, is calm and drowsy (in one case asleep). The pulse is slow and full, the respirations quiet and regular, the mouth dry, and as a rule, the pupils slightly dilated, though reacting to light. The patient takes the ether quietly and without struggling, and quickly becomes unconscious. There is little or no secretion of fluid from the mouth or respiratory tract. There is no rigidity and no cyanosis. The face is usually red. In from three to five minutes the patient is lying as if calmly asleep. Anæsthesia is then maintained with a very small expenditure of ether, and during the operation there is no vomiting or obstruction to respiration from secretion of fluid in the respiratory passages. The patient recovers consciousness rapidly, but during the first twelve hours after the operation is quiet and has frequent periods of sleep. Vomiting in a large proportion of cases is absent, and in no instance was it severe or prolonged. Nausea is much lessened. The mouth is for some time dry and thirst is complained of.

No symptoms of danger have as yet occurred. In all the cases the pulse was slow and full, and the respirations remarkably easy and satisfactory. The results in detail are as follow:—

The hyoscine was given in fifteen cases, all females, the Clover's inhaler being used. Nine cases were major oprations, abdominal sections. Four cases were plastic operations. One case was an examination of the bladder.

The amount of ether used averaged a fraction over 2½ ounces an hour.

The longest anæsthesia was three hours and thirty-three minutes, the shortest, fifty-six minutes.

The smallest amount of ether used was 5½ ounces for an operation which lasted two hours and a-half. The largest amount was 9¼ ounces in three hours and eleven minutes.

There was no cyanosis and no vomiting during the administration of the anæsthetic.

In thirteen cases there was no excitement or struggling during the anæsthetization. In two cases there was some fear shown at the outset, but as soon as regular inhalation was induced all excitement ceased.

The pupils in five cases were dilated. In the others they were neither contracted nor dilated.

In no case did the pulse rise in frequency over 116 to the minute, though several operations were very severe ones. In one case the pulse was slowed to 64, and in two cases to 68. The average pulse rate was about 84.

The respirations in one case increased to 44 and in one case were 16; they averaged 28 to the minute in all the cases.

There was no cyanosis in any case. There was no obstruction from mucus.

In one case, at the close of the operation, as the patient was coming out of ether, there was muscular rigidity and tremor.

The average time which it took to produce surgical anæsthesia was 5½ minutes. The shortest time was 3 minutes and the longest 10 minutes.

In no case was there excitement during recovery from the anæsthetic. In all cases there was drowsiness after the operation with frequent sleep during the night.

In ten out of the fifteen cases there was no vomiting after the anæsthetic. Three vomited very slightly. One vomited once several hours after the operation. One vomited five or six times. In the fifteen cases preceding these, and in which hyoscine was not used, three patients did not vomit and twelve did, one severely.

In conclusion, I may say that the nurse who has had charge of the patients immediately after operation, and who has had an opportunity

of observing in a long experience hundreds of cases, has noticed a distinct amelioration of the distressing symptoms usually following the administration of ether, since the hyoscine has been used.

My own belief, after an experience of over 500 cases of anæsthetization by Clover's inhaler, is that hyoscine hydrobromate makes the administration of ether easier and the after effects much less serious. A large number of cases are required to establish my belief as a fact, but I hope that the anæsthetists of Montreal will give hyoscine a trial and report their results.

A CASE OF FŒTUS AMORPHUS ANIDEUS.

BY

RIDLEY MACKENZIE, M.D., AND JOHN McCRAE, M.B.

The clinical history is of but little interest. The patient from whom the specimen was obtained is of English birth, age thirty, a multipara. Her previous pregnancies were uneventful, and one of them plural. She was delivered after a tedious labour at full term of a living, poorly nourished female child. The whole period of gestation was one of distress, with vomiting and general weakness. The patient has mitral stenosis with hypertrophy and dilatation, and is very anæmic. The urine also contained albumen and casts. The Anidean fœtus and the single placenta were expelled together, having a common amniotic sac and the cords a marginal insertion.

The puerperium was normal.

The placenta was of the usual colour, and measured 18 x 13 x 3.5 cm. The cord was tied at 35 cm. length; the membranes seemed complete. Close to the attachment of the cord was a second miniature cord 6 cm. long, at the end of which was a pinkish brown mass 3 x 2.5 cm., ovoid in shape, firm in consistence, an indistinct hard mass in its centre. The twist of both cords is in the same direction, and on holding the lesser cord up to the light, several small vessels are seen indistinctly, one of which at least joins the larger cord. The chorion common to both is reflected from the larger to the smaller cord, and in the web between the two, the vessel runs. The miniature cord has a consistence, colour and degree of twist similar to the larger one.

The surface of the foetus, by the aid of a hand lens, can be seen to be covered by fine hairs, which do not seem more plentiful on one pole than the other. On section the cuticle (if it may so be called) seems more resistant than the tissue underlying it, and the firm mass in the centre is mainly cartilage of irregular shape, interspersed by small irregular, pin-head-size areas of spongy bone (which may represent centres of ossification); the tissue surrounding the cartilage is fibrous, connective tissue, plentifully interspersed by muscular fibres. Hair follicles are numerous at the surface, the true skin is represented by epithelial cells in layers two or three deep, the nuclei large and uncompressed. In places, the skin appears as a moderately dense matting of fibres, with few nuclei, resembling rather a fibrous capsule than a true skin.

The nourishment of the fœtus has been carried on by an artery and

vein in the cord, one of which (presumably the artery) joins the larger cord; it is doubtless through this vessel that the circulation of the amorphus fœtus has been kept up; the only blood vessels seen in the fœtus are large, thin-walled veins and sinuses, lined by endothelium of the ordinary type.

This fœtus belong to the class defined in a recent article by Ballantyne ("The Fœtus Amorphus," in *Teratologia*, April, 1894), as "Fœtus Amorphus Anideus": This may be defined," he says, "as an allantoido-angiopagus twin which has entirely lost the external form proper to the fœtus, and consists of an ovate or rounded skin-covered mass, without indications of limbs." The condition is a rare one: in nineteen cases quoted by Ballantyne in the above-mentioned article (which reviews thoroughly the literature), it will be noted that the size of the fœtus is much greater than in the case described here, the smallest of those quoted being 5 x 4.5 cm.

Notwithstanding the smaller size, and the apparent disorder and shapelessness of the internal structures, the case falls in every essential under the Anidean group of Fœtus Amorphus.

INFARCTION OF THE ADRENAL.

BY

PAUL G. WOOLLEY, B.S., M.D., (J.H.U.),
Fellow in Pathology, McGill University.

In all the history of the pathology of the adrenal glands I have been able to find no records of a case like the one that I shall report.

This case was that of a pauper child, female, and eleven months old, who, previous to death, had had measles, and had been suspected at the time of death of having some throat trouble. At autopsy there was no sign of a lesion referable to the invasion of the diphtheria bacilli.

When the abdominal cavity of the child was opened, a mass was seen in the right renal region, which had the appearance of a hæmatoma. The tumour was about the size of a goose egg and was quite firm in consistence. On closer examination it was found that the right adrenal was embedded in this mass and that the organ showed no sign of rupture, in other words, that the hæmorrhage did not come from the gland. The source of the hæmorrhage could not be ascertained. The right kidney was outside the hæmatoma.

The adrenal body was slightly enlarged and firm, but very dark in colour—almost black, as from hæmorrhage. On section, the lines of the medulla and cortex could be seen with difficulty, and the entire substance of the gland was of practically the same colour. In the medullary portion, and corresponding to the position of the central vein, was a large, round, whitish mass, in size about that of an ordinary match, which had all the macroscopic appearances of a thrombus. The whole length of the central vein was obstructed.

The left adrenal showed some hæmorrhagic spots, but was otherwise fairly normal.

On microscopic examination the proper tissue of the gland seemed to have been completely replaced by hæmorrhage, except for the presence of occasional columns of stained nuclei, the sole remaining evidences of gland substance.

The thrombus was a laminated fibrinous one, with only few leucocytes present, and with little evidence of cellular structure. There were no bacteria in it.

Just outside the cortex of the adrenal and situated in the capsule of the gland, were two small accessory glands, appearing almost normal microscopically, and showing no evidences of hæmorrhages or necrosis. In the middle of the large gland was another small nodule, encapsu-

lated and apparently normal. All of these smaller glands must either have had a blood supply of their own, or have been nourished by a collateral circulation, which had been insufficient for the large gland. The origin of the thrombus could not be decided, it was probably marantic and it was not all organized.

The case is an unusual one not because hæmorrhage into the adrenal is uncommon, for it is not, cases of hæmatoma and blood cysts having been reported by several observers; for instance, by Carrington, Routier, Cestan, Déroubaix, Letulle, Reclus, Fleischer and Pensoldt, Spencer and Wainwright, whose cases are referred to by Rolleston, but, especially, because it is a case of infarction of an entire organ, and such an intense infarction. Welch says, that "if the veins are obstructed to render the outflow nil, or very small, and the arteries are open, the infarction is intense." Here the vein has apparently been completely blocked, and the infarction has been, as we should expect, intense. He also says that, "in consequence of abundant anastomoses this mode of infarction is rare, but it may occur after thrombosis of the mesenteric, the splenic, and the central retinal vein." To this category we may now add the central adrenal vein.

Note.—Since writing the above I have found a paper by Blaker and Bailey in the *British Medical Journal* for July 13, in which four cases of hæmorrhage into the adrenals are discussed. In these cases the most remarkable features were sudden onset, rapid course and sudden termination. In all the cases there were subcutaneous hæmorrhages. All had diarrhœa, or vomiting, or both. A toxic origin is suggested for this symptom complex, which is possibly a disease *sui generis*.

In the case here reported the details were meagre, but the child had been ill with a disorder that suggested at one time measles, at another diphtheria. This is, however, the only case in which infarction is reported.

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Reviews and Notices of Books.

THE CAUSES OF DEATH AMONG THE INSURED IN THE SCOTTISH WIDOWS' FUND AND LIFE ASSURANCE SOCIETY, FROM 1874 TO 1894 INCLUSIVE, reported by CLAUD MUIRHEAD, M.D., F.R.C.P.E., Medical Officer of the Society. R. and R. Clark, Edin.

This report contains a very interesting study of the causes of death in this society during the three septennia, 1874-1894. The report refers only to males, amongst whom there were 9,163 deaths during this period.

Cases of consumption were responsible for 8.796 per cent. of the total mortality, and it is satisfactory to note the percentage decreased during each septennial period, and the average age at death was also rather greater during the later periods. The benefit of selection is shown by a comparison of the mortality in the Society from this cause, with the mortality amongst the general population. The results show a percentage considerably under half the mortality amongst the general population. Hereditary influence, according to Muirhead's tables, does not exert any great influence on the mortality from phthisis. It is, however, hardly fair to draw the inference that hereditary predisposition plays an unimportant part in the mortality. The criticism may be made that the tables do not deal with the large numbers of cases rejected for a tubercular family history, and until the mortality amongst this class is known, a fair basis for comparison does not exist. The report shows that the mortality from consumption is greater amongst light than heavy individuals, whilst the reverse holds good for apoplexy.

The subject of cancer is dealt with in considerable detail, and the increasing mortality from this disease is pointed out.

The report is a most valuable compilation and must prove of much value as a guide to medical directors in the selection and rating of lives. It is much to be desired that other offices should follow the example of the Scottish Widows' in publishing their experience and so placing life insurance on a more certain and scientific basis.

F. G. F.

Society Proceedings.

MONTREAL MEDICO-CHIRURGICAL SOCIETY.

Stated Meeting, April 4, 1902.

G. E. ARMSTRONG, M.D., PRESIDENT, IN THE CHAIR.

Dr. C. B. Keenan, of Montreal, was elected a resident member.

Morbus Coxæ.

DR. E. M. VON EBERTS showed for DR. ARMSTRONG, a young man, aged 20 years, French Canadian, born in Quebec, but living in Montreal since ten years of age. He had had no other illness except the hip disease. The father and mother were both healthy and there was no history of tuberculosis in the family.

The present trouble began with an injury to the left knee by a fall at two years of age. He was confined to bed for two years with the leg in a position of semi-flexion at the knee joint. Six months after the injury, while in bed, he developed pain in the right hip extending down to the knee. Six months later, at the age of three, an abscess developed over the head of the right femur and eventually ruptured in three places, the discharge continuing until seven years of age. When four, or four and a half years old he was able to get up with his left hand resting on his left knee and walked about, the knee being flexed. He had good health until he was 16, when he fell from a street car and broke the left femur at its lower third and dislocated the left knee joint. After treatment for 41 days in the Notre Dame Hospital he was discharged well.

Examination shows a normal condition of the internal organs. The arms are very well developed by the use of crutches; the right leg is flexed, adducted, slightly rotated inwards, almost fixed at the hip joint, and shows very much wasting both at the thigh and calf. The left leg is more wasted than the right, knee joint fixed at an angle of 90°, not capable of being extended, but may be flexed to 45°. The femurs are equal on both sides. The shortening is apparently due to dislocation of the head of the right femur on to the dorsum of the ilium. A skiagraph shows that the remains of the head and neck of the right femur still occupy the site of the acetabulum, and the lengthening on the left side is due to marked tilting of the

pelvis from 4 to 4½ inches, bringing the neck of the left femur almost in a direct line with the shaft of the bone.

Primary Intestinal Tuberculosis.

DR. A. G. NICHOLLS read a report of this case. See page 327.

DR. JAMES STEWART said that when the patient was admitted to the medical wards there was apparently clear evidence of meningitis and it was looked upon as syphilitic because of the marked syphilitic history and the absence of any other cause. No doubt an acute syphilitic meningitis was a very uncommon trouble.

Stated Meeting, April 18th, 1902.

G. E. ARMSTRONG, M.D., PRESIDENT, IN THE CHAIR.

Sarcoma Cured by Repeated Operations.

DR. F. J. SHEPHERD showed a patient, female, from whom he had on April 4, 1901, removed a growth in the right side of the neck extending almost from the clavicle to the mastoid process and covered with a thin bluish skin. The tissue, which proved to be sarcomatous, was scooped out through a long incision, and it was found that the underlying tissues were all involved. After the operation the wound was closed, a drain inserted and it quickly healed. Three weeks later she returned with the mass as large as ever and a second removal was done, followed by healing so rapid that it was amazing. Some weeks later she again returned, and, in Dr. Shepherd's absence, Dr. Kenneth Cameron made an incision and removed the soft fungating mass just as had been done on the former occasions. By July, the wound had healed again, and now nearly ten months afterwards, the neck appeared perfectly normal. The patient had stated that the area affected by the growth had remained red, indurated and swollen for some months and had then gradually disappeared. The tissues removed on each occasion had been examined by Drs. Johnston and McCrae, and the microscopical appearances were typical of alveolar sarcoma.

Dr. Shepherd stated that one other similar case had come under his notice some years previously, when he had assisted a colleague to shell out a tumour which Dr. Osler had pronounced small-celled sarcoma. The wound had healed in the same way and the growth recurred six months later in the submaxillary glands, which were removed. The patient was alive to-day, 15 to 20 years later.

Vesical Calculus with Pyonephritis in a Child.

DR. ANDERSON showed for DR. MACTAGGART a specimen of vesical calculus with pyonephrosis. The child, aged 2½ years, had been ad-

mitted to the Montreal General Hospital in September, suffering apparently from rickets. Under appropriate treatment the child rapidly improved and was discharged apparently cured. A couple of months later it was readmitted, badly nourished and badly cared for. The temperature was very high, and on several occasions the child had a prolapse of the rectum which was immediately reduced by the nurse in charge so that the attending physician had never seen it.

At the autopsy there was found in the bladder a large phosphatic calculus, 3½ by 2½ c. m. filling up the whole organ. There was purulent cystitis and pyonephrosis with markedly dilated ureters.

Two Cases of Carcinoma of the Stomach.

DR. D. P. ANDERSON showed a specimen from a case of carcinoma of the stomach upon which Dr. Armstrong had performed a gastro-enterostomy. The patient, a man aged 48 years, had refused operation until the disease had progressed so far that its removal was impossible. He lived for eleven months after the operation.

A remarkable feature of the case was that at the time this patient was operated upon, his twin brother expressed his belief that he had the same disease. Both men had been suffering from gastro-intestinal condition for years, and in the case of the second one, the symptoms were looked upon as nervous in origin. Some time later, however, the case was proved to be carcinoma, and a gastro-enterostomy performed by a New York surgeon, the patient surviving the operation two months. The specimens exhibited were obtained by a medical student who was present at the autopsy. The age of the patients, 48, was remarkable.

DR. F. G. FINLEY believed that the age of these patients mentioned was 38 instead of 48, making them still more remarkable. The second of these patients had been under his case for a time, complaining of pain in the epigastrium not always associated with the taking of food. There had been no tumour or distension, but persistent absence of hydrochloric acid as shown by a number of test meals. Lactic acid was demonstrated on one occasion. As the probabilities were in favour of cancer the patient was advised to have an exploratory incision, but as his condition improved he would not consent. It was possible that if the exploratory operation had been undertaken when advised that the disease might have been removed.

Spinal Localization in Connection with Spinal Fracture.

DR. D. A. SHIRRES read this paper, which will be published in full in a later issue.

THE PRESIDENT congratulated Dr. Shirres upon his working up of his subject. A number of these cases of accident involving the spinal

cord were admitted to the hospital every year, and he had succeeded in treating one case successfully. The case was that of a man who received an injury at the level of the tenth or the eleventh dorsal vertebra which caused paresis of the muscles. Manipulation and extension with the aid of two orderlies succeeded in reducing the apparent deformity, and the paresis gradually passed off. Experience gained previous to this case had caused the speaker almost to make up his mind never to operate when there was complete motor and sensory paralysis. This case, however, and the published reports of experience at the Massachusetts General Hospital showing that improvement followed interference in some unlikely cases, had caused the speaker to decide that until it was shown that operation did harm in these cases it was the duty of the surgeon to expose the seat of injury in the hope of doing good.

Stated Meeting, May 2nd, 1902.

G. E. ARMSTRONG, M.D., PRESIDENT, IN THE CHAIR.

Recovery after Operation for Typhoid Perforation.

DR. F. J. SHEPHERD exhibited a patient upon whom he had operated on May 27, 1901, for typhoid perforation. The patient, a lady, 29 years of age, had been under treatment in the private medical wards of the Montreal General Hospital, and during the second week of the fever, and without any previous symptoms of severe ulceration, the perforation occurred. A diagnosis was made at once, and twelve hours later the abdomen was opened in the usual way by a lateral incision over the ileo cæcal junction. After closing the ulcer the abdomen was washed out with saline solution, but a good deal of suppuration followed with the result that there was a hernia at the site of the wound, and the patient was wearing a truss. She made an uninterrupted recovery.

Dr. Shepherd expressed his preference for the lateral operation as giving access to a part of the intestine where one was most likely to find the perforation, near the ilecocæcal valve, whereas by opening in the middle line it was not possible to tell what part of the small intestine presented, and often many feet of bowel had to be pulled out before the lesion was found.

Dr. Shepherd further stated that the first successful operation for typhoid perforation which he had performed had been in October, 1900, upon a patient of Dr. Ridley Mackenzie's, who recognized the condition and sent the patient at once to the hospital. The operation was done ten hours after perforation and there was free pus found in the abdomen, which, however, was sterile. His second case was the

one reported above, while the third, also a patient of Dr. Ridley Mackenzie's, was operated upon on July 4, 1901. Perforation had occurred in the third week of disease, and operation was done two hours afterwards. The man had been very ill after operation, his temperature rising to 104°, but he recovered without any hernia.

DR. RIDLEY MACKENZIE said that the two cases under his care had been utterly different. The first was a woman with ambulatory typhoid who had been unwilling to take care of herself, and, consequently, he had refused to attend her. Later, he received a message that the woman was dying, and found a condition of general peritonitis some eight hours after perforation. The second case had been under careful treatment from the first.

DR. ELDER corroborated what Dr. Shepherd had said about the lateral incision being the proper one in these cases, as the ulcer was nearly always found within a short distance of the ileocæcal valve.

Cholelithiasis.

DR. CAMPBELL HOWARD read the report of this case for DR. ELDER. It will be published in full later.

DR. ELDER said that the case was briefly, that the woman had a mild attack of typhoid fever last year, left the hospital, gave birth to a child, and returned to hospital in April for repair of the perineum, when she developed pain and high temperature. She got better and left the hospital again, but five days later was seen by Dr. Bazin, who made a diagnosis of gall bladder trouble. When she was admitted there was a tender point just to the right and above the umbilicus, with evidence of localized peritonitis about the gall bladder. At the operation a very much distended gall bladder full of clear mucous fluid was found with a stone in the cystic duct near its junction with the common duct.

Dr. Elder pointed out also that where the stone consisted of several small calculi glued together into one mass there was associated perulent condition. He had written to Mayo Robson enquiring whether he had any knowledge of this point but received a negative reply. He also drew attention to a method of performing the operation different to that usually employed. After the gall bladder had been exposed two silk sutures were passed through it in the usual way to hold it in place while making the incision. The gall bladder was then examined, the calculus removed and a drainage tube inserted, when instead of stitching the gall bladder to the peritoneum the sutures were passed through the whole thickness of the abdominal wall some distance back from the second incision and on each side. After the second incision had been closed, the sutures were tied and left there.

Five days later the sutures were cut and removed and the fistula closed much more quickly than was usually the case.

DR. BAZIN said that an additional point of interest in the case was that since the attack of typhoid fever the patient had been living a sedentary life, earning her living by sewing in a damp underground cellar. Three days after she left the hospital for the second time he had been called to see her, and found her suffering from severe pain in the gall bladder, which was enlarged to such an extent that it reached down to the level of the umbilicus. It must, therefore, have decreased considerably before she was admitted to the hospital for the last time.

DR. SHEPHERD said that some ten or fifteen years ago the method of operation described by Dr. Elder had been extensively employed and he could not say why it had gone out of general use. He related a case in which after the removal of two large stones the fistula was healed and the woman out driving in ten days. The rapidity of healing depended upon what the gall bladder was sewn to, when attached to the peritoneum it healed very rapidly, but if brought out to the skin a fistula was liable to persist.

Aneurism of the Innominate Artery.

DR. MAUDE E. ABBOTT showed a specimen of aneurism of the innominate which had been sent to the museum by Dr. Proctor. The aneurism arose from the neck of the innominate directly after its origin and the artery was very much distended. The left wall appeared to be preserved while the right wall had given way and a large false aneurismal cavity had formed which had eroded the clavicle in its outer portion.

Aniencephalus Monster.

DR. MAUDE E. ABBOTT also showed an aniencephalus monster sent in by Dr. Dewar, of Ottawa. Skiagrams of the case were shown and enlarged diagrams of a case reported by Ballantyne which closely resembled the present case.

Note on a Rapid Blood Stain.

DR. F. M. FRY described a rapid blood stain.

Lantern Demonstration of Skin Diseases.

DR. F. J. SHEPHERD gave a lantern demonstration of various forms of skin disease, explaining and describing the conditions as the pictures were thrown upon the screen. The demonstration included a very beautiful series of variola, ringworm, sycosis barbæ, molluscum contagiosum and many others. Noticeable among them was a very complete group of tertiary syphilides.

Correspondence.

NO. X. CANADIAN FIELD HOSPITAL.

Head-Quarters, Canadian Field Hospital,
Kekewich's Column,
Vaalbank, Transvaal.

To the Editors of the Montreal Medical Journal.

As the 10th Field Hospital is the first Canadian organization of the kind equipped for service abroad, I trust a few remarks about the movements and work of the company may not be without interest to some of your readers.

Under the able supervision of the Director-General, the corps was formed in December last, given the most improved equipment as regards tents, transport wagons, (convertable into ambulances), general hospital appliances, and medicines, and accompanied the Canadian Mounted Rifles to South Africa.

Leaving Halifax January 28th, after an uneventful voyage (save for the occurrence of a few mild cases of smallpox and measles), we arrived at Cape Town February 21st, and were ordered to Durban. From there we proceeded to Newcastle by rail, and went into quarantine for two weeks; having in the meantime suffered much from divers quarantine officials in the way of vaccination, with varying success.

One day Lord Kitchener visited the camp and inspected the hospital, telling us we were to accompany the Canadian troops. At the expiration of another week, and after a very trying march through Laings Nek, we found ourselves at Klerksdorp; this town is near the scene of Methuen's disaster, and the centre of all concerted action against Delarey, Kemp, DeWet and Co. General Walter Kitchener took a section of the hospital with four wagons for his columns, and the other, in response to a wire from Kekewich for 50 beds, was sent to Vaalbank, 40 miles away.

This being the angle on the Lichtenberg blockhouse line, on to which

the various columns intended driving, a hospital was much needed at this point.

Here we are at present with a daily average of sixty patients and with very short notice of their arrival, as a glance at the following telegrams will show:—

"Convoy with 45 sick and wounded, Grenfell's column, leaving this morning, arrive to-morrow."

"Seventy-five sick arrive to-morrow."

"Notify O.C. hospital 80 wounded, including 24 Boer prisoners, leave to-day, arrive about fifteenth.

With the former convoys came all sorts of ailments, varying in severity from veldt sores to bad cases of enteric and dysentery. Various are the methods of treatment adopted by the different hospital and medical officers, for prevalent diseases, according to their proportion of success with different redemies. With veldt sores we have had most success by local treatment with moist antiseptic dressings (preferably boracic), until the sores look healthy, then dry dressing with aristol or boro-acetanilid. Internally, calcium sulphide, fairly large doses; change of diet (when procurable), with lime juice and vegetables. In cases of dysentery, we get best results with Henry's solution (mag. sulph., and acid sulph. dil.), one drachm doses every hour until the blood and mucus begin to disappear from the stools, then astringents with opium; or when the movements are very frequent hypodermics of morphia. Absolute rest is a most important factor in the treatment; a tablet composed of "three carbolates" (calcium, sodium, and zinc, 5 grains each) we have used with success in these cases and in enteric, but as yet not sufficently long to justify a decided opinion as to its efficacy. Enterics are certainly the most trying in Field Hospitals; they frequently come to us on ox-wagons, a distance of 25 to 40 miles in the second week of the disease, and as we are obliged to keep our wards as clear as possible for emergencies, it is often necessary to transfer them to Klerksdorp, a distance of 40 miles, from where they are again shipped by hospital train to Joeberg. Most of these patients, worn out by continued treking, and army rations, require stimulants early, and careful feeding. As we have no cots, they are placed on stretchers; one advantage being that in this way they can, owing to the convexity of the canvas, be readily sponged with the aid of a rubber sheet, and the water run off into a pan, by simply raising the end of the stretcher.

With the 80 wounded who arrived on the fifteenth, in accordance with telegram mentioned, came gunshot wounds of every description. As an instance of how severe many of these were, and of how vital organs may be injured and recovery take place, I append a short description of a few coming under our especial notice.

1. Officer 21st. M.I. Gunshot wound of left thorax; point of entrance about middle of left scapula, below spine; point of exit, junction of second costal cartilage with sternum. Wounds cleansed and sealed with collodion and iodoform; uninterrupted recovery with no special disturbance beyond slight cough and dyspnœa. Eleven days after injury was transfered to Johannesburg.

2. Private of 20th. M.I. Gunshot wound received March 24th, at Reitfontein; point of entrance, external surface of lower part of upper third of left thigh; exit at ascending ramus of left pubic bone; ball then grazed scrotum and penis; entered right thigh below middle third of Poupart's ligament and came out in front of great trochanter, grazing the femoral artery and causing a fusiform aneurism. Patient also shot through right arm, with injury to median nerve, causing pain and numbness to forearm, and leaving a hard indurated mass along the course of the nerve. Transferred to 32 Stn. Hospital on 12th day.

3. Lieut. 21st. M.I. Gunshot wound of thigh, abdomen and chest; points of entrance junction of lower and middle third of left thigh, outer side; exit centre of upper third, just to outer side of femoral artery. Second entrance just below the ribs on the left side, at inner angle of left hypochondriac region; second exit between scapula and spinal column, at third dorsal vertebra; wounds entirely healed, and patient sitting up twelve days after injury.

4. Private of Camerons. Gunshot wound of head, entrance through right malar bone; point of exit, mastoid process on same side. Wound washed and dressed, patient in a few days going about the camp, doing remarkably well.

5. Private I.Y. Shot through the middle of upper lip, ball coming out in back of neck, little to left of middle line, and almost directly opposite to point of entrance; also shot through right shoulder; no serious inconvenience from either wound. When first dressed, patient, a young lad, exhibited great pleasure when told he was shot through the moustache, saying he was never credited before with having one.

6. Boer prisoner. Shot through the head just about zygoma on one side; ball coming out directly opposite, wounds healed readily; good recovery.

7. Boer prisoner. Fracture of the skull with injury to brain; ball passed diagonally along upper surface of left hemisphere to right; gutter fracture four and a half inches long, and one inch wide; paralysis of limbs on opposite side; marked ecchymosis of face, but no facial paralysis, slight ptosis of right eyelid, and slight interference with speech. Extensive injury to brain substance caused

by depressed pieces of bone. With careful removal of these and protruding brain substance, irrigation and light packing; ptosis disappeared and speech improved; and at present, twelve days after injury, patient is doing well, eating well, and conversing with his fellow prisoners.

8. Private 22nd. M.I. Wounded March 22nd, at Reitlei; gunshot wound of abdomen; ball entered left side, two inches above and anterior to great trochanter, emerging just above the crest of ilium on opposite side, direction being obliquely upward from entrance to exit. Patient lay on ground seven hours and then walked two and one half miles to Boer farm-house; wound not dressed for 32 hours. Good recovery.

9. Field Cornet. Gunshot wound of left leg, compound fracture, also shot through liver and abdomen; entrance on right side about middle of liver dullness; exit in line and to left of spinal column, patient doing well; abdominal wounds healed; slight pain and tenderness over liver; leg improving; no shortening.

10. Boer prisoner. Shot through the head; point of entrance to left of occipital protuberance; exit through left mastoid process; ball then taking off top of ear. Scalp opened along course of ball; very septic; all pieces of bone removed and also protruding brain matter; wound irrigated and lightly packed with iodoform gauze; and top of ear stitched on; patient did well; improved for several days, getting up to stool, etc., but died rather suddenly probably from thrombosis in lateral sinus.

11. Private 21st. M.I. Gunshot wound; point of entrance one inch above and one inch to inner side of anterior superior spine of left ilium. Exit through junction of lumbar vertebræ with sacrum. Retention of urine for 4 days; requiring catheterization. Pain in left leg. No paralysis, patient convalescent.

12. Boer prisoner, khaki clad, with Yeomanry hat; gunshot wound of thorax; point of entrance to right of middle sternum; ball, (shrapnel bullet), excised from skin a little posterior to mid-axillary line. Probing showed ball entered thorax, but patient made a good recovery with no serious symptoms.

13. Boer. Gunshot wound of left lung, very septic; wounds alive with maggots. Point of entrance posterior to mid-axillary line at lower angle of scapula; exit one inch below, and one inch to left of nipple. Exit wound very large, through which a large open gangrenous wound in lung can be seen, and through which a tube can be passed to back of thorax. Great difficulty in breathing. Posterior wound having closed at once, was reopened; the cavity irrigated with boracic solution; drained from posterior wound, and opening in lung lightly

packed with sterilized gauze. Cavity did not drain satisfactorily through posterior opening so patient had to be rolled on his side occasionally to allow anterior drainage. At present, 12 days after receipt of injury, patient is improving and likely to recover.

In addition to these cases we received by same convoy at least nine septic compound fractures; five of femur, and four of tibia. Indeed most of the wounds are in a septic condition when they reach the hospital; and in the case of compound fractures, owing to the necessarily limited supply of long splints, and the shortness of time devoted to first dressings, these generally have side or co-oaptation splints applied over the entrance and exit wounds, blocking the discharge; but when opened drained and packed (after removal of spiculæ), they do well.

In the case of the wounded Boer prisoners, many of whom are found at farm-houses, and brought in, the stench from the wounds was horrible, in fact it soon permeated the whole camp, and necessitated a cigarette while operating, a copious use of deodorants, followed by a little liquid refreshment. Brother Boer bears his sufferings manfully and seldom complains. As an instance of what he can go through I may instance a case that occurred after Grenfell's fight on the 11th inst. A Boer with both testicles shattered galloped seven miles and then put up a fight before captured.

Contrasting the nature of their wounds, with those of our men it would, on the whole, show the superior marksmanship of the latter, though this may be accounted for by the fact that the Boers at this stage of the game frequently gallop up to within close range, firing from their horses as they advance; while our men dismount and lie down. As an explanation of the non-severance of large vessels and nerves by bullets crossing their course, the idea would suggest itself that their escape is due to their elasticity, and a certain amount of laxity (especially in the abdominal and thoracic cavities), which allows of their being pushed aside, unless struck in the mid-axis of their structure; and to the high velocity of the projectile.

The operating and dressing incident to the arrival in hospital of about 70 cases of septic gunshot wounds is sufficient, even with a good dust storm in progress, to keep a man from standing around and catching cold; and taxes our sterilizing apparatus to the utmost.

The left section, with Gen. Walter Kitchener's column have also been busy with sick and wounded, especially after Cookson's fight (where the Canadians did so well). Here Lieut. Roberts and those under him behaved with the greatest gallantry; dressing the wounded under a heavy shell fire, which killed several of the horses on their

wagons, which were the target of the Boer guns. He is mentioned in "despatches," and will we trust receive some further recognition of his bravery in due course.

If not trespassing too much on your valuable space I hope by the next mail to send you a short description of our equipment, plan of encampment, and its advantages; and the adaptability of our transport wagons for ambulance work.

A. N. Worthington, A.M.S.,
Lt.-Col. Commanding No. X Field Hospital.

THE

Montreal Medical Journal.

A Monthly Record of the Progress of Medical and Surgical Science.

EDITED BY

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FRANK BULLER, F. G. FINLEY,
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VOL. XXXI. JUNE, 1902. NO. 6.

THE CANADIAN MEDICAL ASSOCIATION.

The Canadian Medical Association will meet this year in Montreal, on September 16th, 17th and 18th. This time of the year has been selected by the Local Executive Committee in order that all may avail themselves of the meeting, and it is expected that an unusually large number of members will be present.

To those who contemplate attending the meeting, the following facts will be of interest:—

ARRANGEMENTS FOR TRANSPORTATION:

The following arrangements will be in effect for the Meeting of the Canadian Medical Association at Montreal, September 16th to 18th, 1902:

In order to take advantage of these arrangements it will be necessary for Members to obtain, from agent at starting point, a Standard Convention Certificate, showing purchase of one-way first class ticket to Montreal, between September 12th and 18th (both days inclusive), which certificate will be honored on or before September 22nd, 1902, in Montreal, by ticket agent of the line on which they arrive, for

ticket back to their original starting point when certificate is endorsed by Secretary to the effect that delegate has been in attendance at the Convention, on following basis:—

From Points South and West of Montreal:—

If 300 or more attend, holding Standard Convention Certificates, they will be given tickets for return, free, to original starting point via same route as used to Montreal.

If less than 300 (and more than 50) delegates are in attendance, holding Certificate, they will be given tickets for return to the original starting point, via same route as used to Montreal, at one-third of the one-way first class fare.

From Points West of Fort William:—

[Should special concessions relative to time limit be granted, particulars will be announced later.]

If 50 or more delegates are in attendance, holding Standard Convention Certificates, delegates from Toronto or Kingston travelling to Montreal via Richelieu & Ontario Navigation Co. may return via Grand Trunk or Canadian Pacific Railways on payment of $5.00 to Toronto, or $3.50 to Kingston. Delegates from Toronto or Kingston travelling to Montreal via Grand Trunk or Canadian Pacific, may return via Richelieu & Ontario Navigation Co. on payment of one-half the fare paid on going journey.

From Points East of Montreal:—

If 10 or more delegates are in attendance, holding Standard Convention Certificates, delegates east of Montreal will be given tickets free, for return.

Any further particulars may be obtained from the General Secretary, Dr. Geo. Elliott, 129 John St., Toronto, or from the Chairman of the Transportation Committee, Dr. J. Alex. Hutchison, 70 Mackay St., Montreal.

Local Arrangements:—The Meetings will be held in the various rooms of the Medical Faculty of McGill University.

Programme:—There will this year be two Sections of the Association, one mainly Medical, the other mainly Surgical. The address in Medicine will be given by Dr. Wm. Osler, of Johns Hopkins University, Baltimore; that in Surgery by Dr. John Stewart, of Halifax.

In addition to this, on two days of the meeting, clinics will be held in the Hospitals at such times as will not interfere with the general programme of the Meeting, and will yet enable all those who care so to do to see or to exhibit living cases or specimens which may be of interest to the Members.

Pathological Museum:—The Museum this year will be one of the features of the Meeting, and circulars have been issued by the Secretary of the Museum Committee, Dr. M. E. Abbott, announcing the intentions of the Committee. Any contributions in the way of specimens will be gratefully received by the Secretary, and every care will be taken of specimens lent, and, as soon as the meeting is over, they will be repacked and reshipped to the owners by a responsible person. Specimens for the exhibition should arrive not later than September 6th. The Committee is desirous more particularly of obtaining series of specimens illustrating diseased conditions of the Liver, Gall Bladder and Pancreas. To all those who may not have received circulars containing details of the Pathological Exhibit, the same may be had on application to Dr. M. E. Abbott, McGill Medical College, Montreal.

The Museum of Commercial Exhibits, which is under the special charge of Dr. J. W. Stirling, 255 Mountain Street, Montreal, will be found in the most suitable part of the Medical Buildings, the space allotted therefor occupying the main hall of the building. Many applications have been received from various manufacturers and instrument dealers so that a large and interesting exhibit is expected.

LOCAL COMMITTEES:

The Local Committees are as follows:—

Executive Committee:—President, Dr. F. J. Shepherd; Vice-President, Dr. J. Alex. Hutchison; Local Secretary, Dr. C. F. Martin; Local Treasurer, Dr. J. G. McCarthy; Council: Drs. James Stewart, F. G. Finley and J. M. Elder.

Reception Committee:—Sir Wm. Hingston, M.D., Chairman; Dr. E. P. Lachapelle, Dr. F. W. Campbell, Dr. Robt. Craik, Dr. T. G. Roddick, Dr. D. C. MacCallum, Dr. R. F. Ruttan, Hon. Jos. Guerin, M.D., Dr. James Perrigo, Dr. J. P. Rottot, Dr. A. R. Marsolais, Dr. James Stewart, Dr. T. J. W. Burgess, Dr. A. Brodeur, Dr. J. E. Dubé,

Entertainment Committee:—Dr. H. S. Birkett, Chairman; Dr. James Bell, Dr. C. W. Wilson, Dr. K. Cameron, Dr. J. W. Stirling, Dr. W. G. Stewart, Dr. J. A. LeSage, Dr. W. H. Drummond, Dr. H. B. Yates, Dr. W. W. Chipman, Dr. A. Lapthorn Smith, Dr. L. deL. Harwood.

Programme Committee:—Dr. J. G. Adami, Chairman; Dr. F. G. Finley, Dr. A. DeMartigny, Dr. C. N. Valin, Dr. J. M. Elder, Dr. A. T. Bazin, Dr. J. E. Dubé.

Transportation Committee:—Dr. J. Alex. Hutchison, Chairman; Dr. G. E. Armstrong.

Finance Committee:—Dr. H. L. Reddy, Chairman; Dr. Jas. Perrigo, Dr. W. A. Molson, Dr. D. J. Evans, Dr. F. R. England, Dr. S. Boucher,

Dr. J. G. McCarthy Dr. Wm. Gardner, Dr. W. F. Hamilton, Dr. L. J. V. Cleroux, Dr. G. Gordon Campbell.

Pathological Museum Committee:—Dr. Andrew Macphail, Chairman; Dr. Maude E. Abbott, Secretary; Dr. A. J. Nicholls, Dr. Wesley Mills, Dr. J. B. McConnell, Dr. A. Mercier, Dr. J. A. Springle, Dr. E. P. Benoit, Dr. A. Bernier, Dr. Rene Hebert, Dr. A. D. Blackader.

Exhibition Committee:—Dr. J. W. Stirling, Chairman; Dr. Ridley McKenzie, Dr. C. A. Peters, Dr. A. W. Haldimand.

PAPERS.

Some of the papers already promised are as follows:—

Dr. W. Corlett, Cleveland—Lantern Demonstrations on Exanthemata.

Dr. J. O. Orr—Artificial Astigmatism.

Dr. C. A. Wood, Chicago—Empyema of Frontal Sinus.

Dr. P. G. Goldsmith, Belleville—Management of Cases of Nasal Obstruction.

Dr. J. F. MacDonald, Hopewell, N.S.—Tuberculosis.

Dr. A. R. Robinson, New York—X-ray in Cancer.

Dr. D. A. Shirres, Montreal—Degeneration of Spinal Cord Associated with Anæmia and other forms of Mal-nutrition.

Dr. James Stewart, Montreal—On Some Points in Cerebral Localization. Illustrated by a series of morbid specimens and some living cases.

Dr. A. Primrose, Toronto—Case of Filariasis in Man, Cured by Operation.

Dr. J. R. Clouston, Huntingdon—The Country Practitioner of To-day.

Dr. A. H. Ferguson, Chicago—The Pathologic Prostate and its Removal through the Perinæum.

Dr. A. E. Orr, Montreal—Clinical Observations on Blood Pressure in Diseased Conditions.

Dr. H. D. Hamilton, Montreal—Complete Occlusion of the Posterior Nares.

Dr. Maude Abbott, Montreal—On Methods of Museum Classification or Arrangement.

Papers have also been promised by Drs. Armstrong, Ingersoll Olmstead, D. C. Meyers, G. S. Ryerson, F. A. L. Lockhart, L. Smith, G. A. Peters, P. Coote, J. W. Stirling, F. Monod Rudolf and many other.

HYOSCINE IN ETHER ADMINISTRATION.

We have to record in a paper presented before the Montreal Medico-Chirurgical Society by Dr. E. A. Robertson, published this month, a means of preventing the untoward after effects of ether anæsthesia. So many drugs have been vaunted as of use in this respect, and the advantages gained by their administration have been so often offset by their

disadvantages and their uncertainty of action, that anæsthetists have almost entirely discarded them. We do not, however, ever remember to have seen the hydrobromate of hyoscine recommended for this purpose, and, judging from the results obtained by the author of the paper in his short series of experiments, it is worthy of an extended trial. As Dr. Robertson states in his paper, his cases have as yet been too few to reach any conclusive opinion, and it may, furthermore, be said that the class of patients on which his observations were made, is least likely to present any untoward effects from the action of the drug itself, the majority of gynæcological operations being performed upon patients who are not suffering from acute affections requiring immediate surgical interference. Whether it will be found as safe and sure in its action in cases where shock following accident, pain or high temperature complicate matters, can only be determined by experiment.

Were, however, hyoscine only found of value in the class on which these first observations of its action have been made, it will prove a great boon both to the anæsthetist and the anæsthetized, as undoubtedly the dread of operation to many lies solely in the fear of experiencing the distressing effects produced by the anæsthetic.

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AMERICAN MEDICO-PSYCHOLOGICAL SOCIETY. At the invitation of Montreal Medico-Chirurgical Society, the meeting of American Alienists was held in Montreal from the 17th to the 20th June.

The Society met at the Windsor Hotel, and the gathering was the largest in its history—over 180 delegates being registered from all parts of the States and Canada.

The members of the Association were received and welcomed by Lieutenant-Governor Jetté, and by Dr. Armstrong, president of the Medico-Chirurgical Society.

During their stay the members of the Society were introduced to

the Mayor and Aldermen, who entertained them with a drive and luncheon on Mount Royal. They were also tendered a luncheon by the Medical Faculty of McGill University, and a reception by the Board of Management of the Verdun Asylum.

Perhaps, the most successful entertainment was the smoking concert given by the Medico-Chirurgical Society. The efforts of the various members who took part were heartily appreciated, and the variety and quality of the talent supplied fairly surprised the majority of the local members.

Dr. Mills, Professor of Physiology, McGill University, delivered the annual oration, giving a most interesting and scholarly address on the reflexes, and which we print on another page.

Dr. Burgess, as Chairman of the Committee of Arrangements, is to be congratulated on the pleasant and successful character of the meeting. We sincerely hope to again have the privilege of welcoming this Society at some future date in Montreal.

In his paper on "The Family Physician of the Past, Present and Future," Dr. Knopf pictures the practitioner of twenty-five and fifty years ago, his labours and his trials, also the pleasant incidents of his life as a friend and counsellor of the family in the services in which he was engaged.

In picturing the family physician of the present day, the doctor points out the unjust depreciation of his value, the unfair competition arising from the numerous systems and schools of medicine, the unscrupulous practice of quacks, and the unfair compensation he receives in comparison with the specialist, particularly the great operating surgeons. Specialization, while indispensable to the progress and perfection of our art, has likewise, when carried to excess, as it is now not infrequently, left its imprint on the career of the general practitioner. The life of the family physician of the present is much harder than it was before the advent of specialization. It is suggested that in compliance with all the rules of ethics, the family physician could receive a better remuneration in cases of operations performed by specialists, by taking an active part in at least the after treatment of patients.

Lastly, Dr. Knopf describes his conception of the family physician of the future. His studies in tuberculosis, not only as a medical but also as a social disease, have convinced him that without the aid of the family physician the solution of the tuberculosis problem is an utter impossibility. The family physician is not only in the position to discover pulmonary tuberculosis at the earliest possible day, and thus increase the chances of cure nearly 50 per cent., but it is also the family physician

who is best able to inaugurate sanitary and prophylactic measures not only in regard to the prevention of tuberculosis, but also of nearly all other diseases. Dr. Knopf believes that the community which pays enough competent general practitioners to look after the preservation of health of all the indigent families will be the financial gainer in the end, and will improve its sanitary and moral condition beyond expectation. All the well-to-do families will then also learn the value of engaging a general practitioner as a permanent family physician. Through such a system Dr. Knopf believes that the family physician of the future will rise again, not only to the height of the social and professional standing which the physician of the past has occupied, but he will rise still higher in importance and in recognition by the laity as well as by the profession. It is the opinion of the Doctor that the family physician of the future should constitute one of the great factors of civilization and one of the most important helpers in the betterment of the sanitary, social and economic condition of the human race.

MASSAGE.

BY

O. R. PETERS, '02.

The term Massage has been widely stretched from its original meaning—viz., kneading, till it has come to embrace in the eyes of the laity, on the one hand, a system of gymnastic exercises, known as the Swedish System, which has for its object the sound physical development of the body, and on the other, that series of jerking and wrenching movements, which is empirically used by a certain class of men, and which is known as "Bone setting."

This paper will deal with neither of these uses of the word, but will be confined to that series of systematic and scientific movements and manipulations, which are now used by eminent men in the profession as aids in the cure of disease and injury. I wish to take up the subject to-night, under the following heads :—

(1) The history of massage.
(2) The forms and methods of application.
(3) The physiological effects of massage.
(4) The uses of massage in surgery and medicine.

The History of Massage :—

The use of Massage is as old, if not older, than any other form of treatment in injury and disease. The earliest definite information we have on the subject dates back to Hippocrates, the Father of Medicine, who in his writings describes its applications and uses.

"It loosens he says, stiff joints, and gives tone and strength to those which are relaxed," and "it must be applied with soft hands and in all cases delicately."

Hippocrates used the rubbings in the treatment of injuries, etc., after the acute stage had passed, and noting the effects he obtained, he says in his Aphorisms, "Hard rubbing binds, soft rubbing loosens, much rubbing causes to waste, and moderate rubbing causes to increase and grow."

Though his notions regarding the circulation of the blood were incorrect, yet his methods and his teachings were in accordance with our present knowledge of the circulation.

He speaks of the process of massage as "Anatripsis" *i.e*, rubbing

up, which as we know aids and does not retard the flow of blood. The knowledge of this fact he probably gained by experience in dealing with effusions, finding doubtless that swellings disappeared most rapidly, when the rubbing was done towards the centre of the body.

Herodotus first proposed gymnastics, combined with massage and rubbing, as a cure for disease, and so successful was he in treating one specially enfeebled old man, that Plato reproaches him for prolonging an existence that could only be a burden to the man himself, as well as to his friends.

Celsus the great Roman physician, who was also an advocate of massage says, "rubbing should sometimes be applied to the whole body as when an invalid requires the whole system replenished."

Lytton in his "Last days of Pompeii" describes the bath which filled such an important place in the daily programme of the Ancients, and so essential was massage to this function, that special slaves were set apart to perform this necessary complement to the daily toilet. The slave who could rub and anoint skilfully soon rose in favor in his master's eyes.

Massage too in the olden days as at the present time played an important part in the training at the Gladiatorial Schools. Before the great games and fights, the combatants were stroked, patted and rubbed, to make the muscles supple and elastic, and after the strain of the contest the victor was rubbed and kneaded to ease the pain and soften the cramped and tired muscles.

Through the Dark Ages, massage must have fallen into disrepute, for very little is heard of the use or great healing powers of rubbing.

Coming down to later times, Ling of Sweden early in the nineteenth century revived the treatment, and in his "Swedish Movement Cure" placed the system on a scientific basis.

A few years later, Dr. Balfour of Edinburgh took up the subject, and in his book entitled "Illustrations of the power of Compression and Percussion in the cure of Rheumatism, Gout, etc.," speaks very highly of the benefits derived from massaging the trunk and limbs especially in cases of gout and rheumatism.

The Forms and Methods of Application of Massage : —

Two forms of massage are spoken of and practised, and both forms have their ardent supporters—I refer to the Mechanical and the Manual. As the mechanical is the shorter, I will deal with it first.

The late G. H. Taylor of New York held that the effects of massage depend as much on the order, rate and quality, as upon the quantity of the motions used. To be of service he said,—massage should have the following characteristics :—

(1) It should transmit vibrations at variable but known rates to any part of the trunk or limbs.

(2) It should impart this action in diversified forms.

(3) It should be capable of confining its action to distinct classes of tissues, *i.e.*, muscles, nerve trunks, nerve centres and separate organs.

These qualities he held, could not be obtained to the required extent by the hands of the operator. He therefore devised a series of machines by which, the rate of motion and the degree of pressure in the friction, percussion and kneading movements could be accurately measured.

Taylor believed that different and definite rates of vibration should be employed for different effects required. Thus the rate of applying percussion, *e.g.*, to stimulate peristalsis, to the abdominal wall should be at least one thousand beats per minute, which rate of course, could not well be reached by the hand even of the most practised operator.

His machine for applying this percussion, was a series of small knobs attached to a revolving wheel, which could be made to impinge with a very light tap, at any required rate, on any part of the body the operator wished. Thus it could be applied to the head, trunk or limbs, or to any special muscle or nerve that required stimulation. The limbs were kneaded between two revolving dises, the rate and pressure of which can be altered at will, and which had the advantage that they could be operated by the patient himself.

Abdominal massage and kneading was done in a somewhat similar way. The patient lay face downward on a table, which had a hole in the centre. A series of knobs attached to levers and revolving wheel protruded through this opening, and with the revolution of the wheel the knobs administered a slow gliding and kneading movement to the abdomen.

The rate of abdominal massage should be about twenty-five strokes per minute, though both the rate and the degree of pressure could be changed at will.

The chief advantages claimed by this system are :—

(1) The rate and quality of massage can be accurately gauged.

(2) The saving in time and energy on the part of the operator.

(3) The patient can after a few lessons learn to work the appliances himself.

Dowse, speaking of massage says, that it should be conducted by the hand and by the hand alone. He defines massage as "The application of sentient living matter to sentient living matter in divers ways, and with an amount of energy in direct ratio with the resistance

which has to be overcome. This definition is not compatible with any form of mechanical appliance that can be invented to perform the work, nor does it seem feasible that any instrument can be made which will have such delicacy of touch or such great adaptability as the human hand. Dowse divides the manipulations employed by the masseur into four classes :—Effleurage, petrissage, tapotement and friction.

Effleurage :—Under this class are those movements, light and stroking in character, which are especially applicable to the head. They affect chiefly the most superficial tissues—the epidermis, and the peripheral ends of the nerves. The results are soothing hypnotic and sleep-producing.

The most severe headache can often be made to disappear as if by magic, by light and gentle movements of this kind.

The whole beauty and perfection of effleurage consists in its very lightness, and the success of a masseuse may lie chiefly in the delicacy of her sense of touch. The stroking in effleurage is sometimes slow, sometimes rapid, every movement taking the direction of the superficial nerves. It has its calming effect not only on the peripheral nerves, but also by induction on the cortex of the brain, and on the vasomotor centres in the bulb. It is especially applicable in cases of emotional excitement and hysteria.

Petrissage :—This includes the pinching, squeezing and kneading movements, by which the deeper structures are brought under the influence of the operator's hand. The fundamental principle of this group of movements is pressure, by which the deep-seated tissues are massed together. This pressure must not be too hard, or the vitality of the tissues will be damaged. It should be rolling in character, diffuse rather than direct.

There are four primary and principal forms of giving petrissage manipulations :—

(1) With the end of the thumb and the tips of the fingers.

(2) With the whole thumb, the entire fingers and the forepart of the palm of the hand.

(3) With the entire hand.

(4) Vibratory petrissage, the tips of the fingers and thumb being used in a vibratory manner.

In carrying out this form of massage the hand should never be entirely removed from the surface of the body, and it is essential to the success of petrissage that the pressure of the kneading hand should be equalized.

The tissues chiefly affected by petrissage are :—The skin, fat, muscles, areolar tissue, trunks and ends of nerves, arteries, veins and

lymphatics, and most important of all, the smallest capillary vessels, where the chief bulk of the tissue respiration is performed. Special care must be taken in this form not to cause the patient unnecessary pain or discomfort. This form is used where we wish to preserve the nutrition of the tissues, *e.g.*, to prevent atrophy of the muscles, after fracture or paralysis.

Tapotement :—By this term is meant the tapping, vibratory, percussive and concussive movements, which are particularly applicable to the back, chest, abdomen and trunk generally.

The mechanical effect of tapotement is chiefly to cause vibrations. This effect is brought about by a series of rapid tappings to the part in which the effect is desired.

The hand is held in four positions in this method :—

(1) The hand is partially closed, the first two fingers resting on the ball of the thumb.

(2) All the fingers are brought together, forming a saucer-like cavity, the effect being partially due to the momentary compression of the air in the palm, when brought in contact with the surface of the body.

(3) The flagellating hand, in which only the tips of the fingers strike the surface, the movement being a series of light rapid strokes, from the wrist alone.

(4) The backing hand, in which the ulnar surface of the hand is made to strike the surface with light rapid strokes. The effect of tapotement is chiefly on the circulatory apparatus, and it varies with the degree of force used in tapping. Light tapping of the surface causes contraction of the blood vessels of the part, while a more powerful stroke rapidly produces dilatation.

Friction is closely related to effleurage and petrissage, its methods of application and its effects may be considered as a combination of the two forms.

The Physiological Effects of Massage :—

Kellog takes up the physiological effects of massage under three heads :—Mechanical, reflex and metabolic.

(1) *Mechanical* :—Where the tissues are altogether passive, the effects resulting from the mechanical action of the operator's hand, *e.g.*, the relieving of stasis in the veins and lymph vessels by simple rubbing and the replacing of prolapsed viscera by manipulations.

(2) *Reflex* :—Where the peripheral manipulations cause stimulation of the nerve centres, which stimuli are transmitted to related centres in the brain. These cerebral centres in turn send out impulses by which vital changes are established in parts of the body, related to those primarily acted upon.

(3) *Metabolic* :—Where important changes take place in the tissue activities, both of the parts directly acted upon, and of the body in general, as the result of the mechanical effects, and of reflex activities set up.

The effects on the nervous system depend chiefly on the kind of massage used, and how it is applied. For example, direct stimulation of the nerve trunks may be obtained by friction, light percussion and slapping ; while the nerve centres are best excited by beating and vigorous backing, especially if applied to the region of the spine.

The sedative effect on the nervous system, on the other hand, may be obtained reflexly by light and gentle stroking, or by prolonged vigorous percussion, which tires out the nerve and finally blunts its sensibility.

Reflex effects are seen in all forms of massage, the most striking results being produced by very light stroking when applied to certain reflex areas. They are, a visible contraction of certain muscle fibres, and a powerful stimulation to the centres in the spinal cord. The part of the cord thus stimulated depends, of course, on the reflex area acted upon—for instance, friction over the epigastric region, stimulates the centres in the cord, from the fifth to the seventh dorsal segment, friction over the cremasteric, stimulates the first to third lumbar segment, while that over the plantar area stimulates the last two sacral segments. The effect on the muscular system is chiefly in increasing the amount of blood flowing through the muscles massaged.

Lander Brunton, from his experiments on animals, draws the following conclusions :—

(1) During massage of muscles, the flow of blood through them is increased.

(2) Immediately after the cessation of rubbing there is an accumulation of blood in the muscles which is rapidly followed by an increased flow of blood through the muscles, an increase from two and four times as great as the normal flow.

The effect of this increased flow of blood, is an increased amount of nutrition brought to the part, a greater amount of respiration in the tissues, and a quicker elimination and removal of the noxious products of metabolism. The muscle becomes larger, firmer, and its tonicity is improved. The circulation is also greatly influenced both locally and generally, by massage, the effects differing as in other tissues, with the modes of application and the parts massaged.

General massage of the body, like exercise, increases the rate and force of the heart beat, but differs from exercise in that it does not cause a general rise in the blood pressure. This is due to the fact

that the manipulations cause a dilatation of the smaller vessels, and hence a lessening of the peripheral resistance. The local effect of massage is to produce an active hyperæmia of the part, due to dilatation of the vessels and the increased flow of blood through them. The activity of the vessel walls is increased and the blood is returned more vigorously to the heart. The mechanical pressure, acting chiefly on the veins and lymphatics, also aid in the return flow of blood.

Local massage, by causing hyperæmia of the part, withdraws for a time, a certain quantity of blood from the general circulation. Thus, massage of the extremities is employed to relieve portal and pulmonary congestion.

Abdominal massage is especially useful in thus sidetracking the blood ; the extractive vessels dilate widely and a considerable quantity of blood is withdrawn from the general circulation. This is a valuable means of relieving cerebral congestion. Another effect obtained is the slowing of the pulse, partly from the decrease in the quantity of the circulating blood, causing a slower filling of the heart, and partly from reflex stimulation of the inhibitory cardiac centres.

The action on the lymph vessels is also important, as by increasing the flow of lymph, resorption of effusions, and the subsidence of swellings are greatly favored.

The uses of Massage in Surgery :—

The chief interest of massage in surgery centres about the treatment of fractures, sprains and dislocations, and much has been said and written for and against its use, instead of the method of perfect immobilization.

Geo. Woolsey, writing in the *Phila. Med. Journal*, 1900, on the treatment of fractures, says : —

"The treatment of fractures, especially near joints, by immobilization is not entirely satisfactory. It imperfectly restores the form of the part, does not favor the repair of the bone, or the restoration of function, but often causes the formation of a scanty callus, delayed or non-union, stiffness of joints, atrophy of muscles and disturbances in circulation."

He advocates in cases of fracture, especially those near or in the joint, that massage be employed daily from the first, each séance lasting about twenty minutes. The fractured limb is put in splints during the interval between massage, to give the patient a sense of security and to prevent displacement of the fragments. The slight amount of movement between the ends of the bone does no harm, but rather favors the formation of a good callus. By this method Bennett claims that he gets firm bony union in from one-third to one-half the time required in the ordinary method of immobilization.

Carl Beck of St. Mary's Hospital, speaks of massage as "A splendid adjunct in the after treatment of fractures." If there is no tendency to displacement, as in the extra articular fractures of the lower end of the radius, massage may be commenced as early as the third or fourth day after the injury. "But," he adds, "to substitute massage entirely for good old immobilization treatment, as has been advocated, is not advisable."

Scudder of the Massachusets General Hospital says :—

"Massage and passive motion should be employed as soon as union is firm, and the anterior and internal angular splints have been removed. It can be given at first without removing the limb from the splint. Convalescence will proceed more rapidly and the function of the limb be restored more quickly in consequence of massage.

Frederick Cotton, in the *Annals of Surgery*, 1902, lays special stress on the value of massage in the treatment of fractures in or about the elbow in children. The liability to permanent stiffness and deformity is greatly lessened by its use.

In the treatment of recent fractures by massage the chief objects are :—

(1) To relieve the spasm of the muscles.

(2) To promote the absorption of effusions.

(3) To promote the more rapid formation of a callus.

(4) To maintain the circulation and the nutrition of the part.

(5) To prevent the formation of adhesions in tendon sheaths and joints.

(6) To prevent the atrophy from disuse of the muscles of the limb.

(7) To keep the nerves from becoming implicated in adhesions and new formed callus.

The methods employed with these objects in view are :—

(1) Gentle rubbing in an upward direction over the fracture and limb above and below the fracture. This soothes the pain, relieves the spasm of the muscles and promotes absorption of the effusions.

(2) Passive motion of the joints above and below the fracture to prevent stiffness and adhesions in the joints and tendon sheaths.

(3) Systematic massage, especially in form of petrissage, of the muscles of the fractured limb, which increases their blood supply, hence their nutrition, and prevents atrophy.

Bennett, in speaking against the principle of prolonged fixation of a joint after dislocation, which has as its object the sound union of the capsule of the joint, says : "In dislocations we should ignore the torn capsule completely, as far as regarding it as an excuse for perfect immobilization. The capsule will unite more soundly under manipula-

tions and massage, than in any other form of treatment, while there will be less liability for adhesions to form in and around the joint. The real cause of secondary dislocation is looseness of the capsule which follows from the muscular atrophy, always seen in prolonged fixation of a joint."

Bennett therefore advocates in dislocations, especially of the shoulder joint, that massage should be commenced immediately after the reduction of the displacement, and after a few days passive motion begins. By this treatment he claims that dislocations of the major joints may be cured in from two to three weeks, without adhesions, stiffness or muscular wasting, and with a lessened liability to secondary dislocations.

In treating sprains by massage, the first indication is to reduce the swelling, by promoting the absorption of the effusion. Here the patient is put to bed, and a light splint applied to the limb, leaving free access to the joint. Gentle massage should be commenced at once, and should be applied at first above the injured joint, in a central direction, to empty the vessels and hasten absorption. This rubbing should be continued for about twenty minutes, and should be done twice a day, the joint in the interval being covered with a lead and opium fomentation. When the swelling begins to subside, massage of the joint and gentle flexion and extension are employed, and at the same time the thigh and leg should be well rubbed to prevent stiffness and the formation of adhesions. Treated in this way, severe sprains can generally get about comfortably in from ten to fourteen days. Where however the joint is extremely inflamed and painful, we must wait till the inflammation has subsided before beginning this treatment.

In acute or chronic synovitis, rest for the part is necessary as long as heat and pain are present, when these subside, massage and passive motions should take the place of the prolonged fixation, and should be used daily, unless there be a return of the heat and pain.

T. B. Wilson, in the *Australian Medical Gazette*, cites an interesting case illustrating another use of massage. The case was one of chronic ulceration of the leg following an injury. Skin grafting by Theirsch's method was first tried, the graft took well, and the ulcer healed, but after a couple of months, the tissues broke down again in the same place. Wilson then determined to try the effects of massage, with the idea of improving the circulation and the state of the tissues of the part, before trying to skin graft again. Gentle friction and kneading were employed, at first above the ulcer, later in the region of the ulcer itself. The results obtained were very good, the circulation in the parts was much improved; there was a gradual

absorption of the hard indurated edges of the ulcer, and the wound finally closed completely, with no other treatment than simple rubbing of the tissues. There was no recurrence of the ulceration.

The uses of massage in medicine are so numerous that only a few of them can be touched upon. It has been successfully used in various forms of nervous disorders, *e.g.*, hysteria, unilateral chorea, neuralgia, etc. Special attention has been drawn to the good results obtained by the sedative effects of cerebral, and the bracing effects of spinal massage.

In progressive muscular atrophy, especially of the spastic type, Osler claims that systematic massage is the best form of treatment. In infantile paralysis, rubbing is of the greatest value as it maintains the nutrition of the muscles, so that in the gradual improvement which takes place in parts of the affected segments of the cord, the motor impulses, on returning, may have the response of well nourished, not atrophied, muscle fibres. Osler says this form of treatment is worth all other measures devised for the disease and should be persisted in for months if necessary.

Chronic constipation offers a wide field for the masseuse, and many cases are reported, showing excellent results from systematic massage. Many methods have been suggested for applying friction in these cases, and each masseuse probably thinks her way is the best. Kimmerling tells us of a method by which he gets very good results.

The patient lies on the right side on a bed or table, the position being made as comfortable as possible. The skin and subcutaneous fat at the level of the left iliac crest are pinched up between the thumb and index fingers of each hand. This makes the descending colon more accessible to the tips of the remaining fingers. Rubbing and pressure movements are made with the tips of these fingers on the colon, working in a downward direction ; this should be continued for about five minutes. The patient is then turned on the left side and the same process applied to the ascending colon, the direction this time, being from below upward. For the treatment of the transverse colon, and small intestines, the patient is put in the genu-pectoral position, which relaxes the abdominal walls, and drops the intestines forward into the operator's hand. Kneading and rubbing movements are made over the trasverse colon from right to left, and general kneading over the lower part of the abdomen to affect the small intestine.

The whole operation should last about fifteen minutes ; it is followed in a short time by an easy and abundant evacuation. Dowse says that to these kneading and pressure movements, should be added

percussion of the abdominal walls to stimulate peristalsis. He also advocates vigorous percussion slapping and backing of the back, spine and buttocks to stimulate the centres in the cord.

Where the bowel is occluded by cancerous or other growths, massage is of course useless, but where the cause of constipation is scybala, defective blood or bile supply, or defective innervation, massage is a valuable remedy. Dowse recommends great care in the treatment by massage of obstruction, where intussusception is suspected, as very disastrous results may follow rough or unskilled handling of such cases. If there be necrosis or gangrene of the intussuscepted part, as sometimes happens, handling may cause rupture of the diseased walls, and a general peritonitis be set up.

One of our clinical teachers looks with disfavor on the use of massage in phlebitis, for he says, by manipulations we may dislodge a portion of the thrombus into the general circulation, which will speedily relieve the patient of the necessity of further treatment, though perhaps not altogether in a manner creditable to ourselves.

Abdominal massage is indicated in neurasthenia and neurosis of the stomach. It increases the tonicity of the abdominal walls, stomach and intestines, and promotes the glandular functions. Under its influence the secretion of hydrochloric acid and the total acidity of the stomach contents is increased. It is also of value in chronic gastritis, atony of the stomach, with or without dilatation, and in dilatation of the intestines.

It is contra-indicated in all conditions of ulceration of the stomach or intestines, in all forms of cancer, in acute inflammations, in hyperacidity, and excess of hydrochloric acid, in prolapsed and sensitive kidney, and in aneurism of the abdominal or thoracic aorta.

If time would permit I would touch on the uses of massage in diseases of the eye, ear and throat, in gynæcology, and in genito-urinary troubles, but I think I have said enough to-night to show what an important subject massage is, and how it may help us in our treatment of a variety of cases.

PAIN AND ITS SIGNIFICANCE IN DIAGNOSIS.

BY

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Pain, according to the dictionary, is defined as an uneasy bodily sensation varying in degree from slight uneasiness to extreme torture. This definition fulfils the scientific conception of the term, and allows its application to any sensation which is disagreeable, or, at least, arouses in us a desire to escape from it. Any of the symptoms indicative of disordered conditions in our viscera, such, for example, as dyspnœa and nausea or vomiting, in themselves alarming and the cause of actual bodily discomfort, might be included in a broad sense under Pain; but in considering the derivation of the word, it is seen that punishment is the main idea, which originally consisted in arousing in some one an acute bodily sensation; so when we talk of pain we usually regard it as a quality of sensation which we express by the phrase "It hurts."

Within the limits of this paper, I hope to regard it as a nerve sensation, which calls our attention to some region of the body more or less definitely, and compels in us a desire to rid ourselves of it, and to see what information it can afford us in abnormal states of the human organism.

In order to investigate such a disturbance in a purely scientific manner, an exact knowledge as to its cause and nature would be desirable; but with our limited knowledge it may be broadly described as a sensory disturbance, and the physiology and pathology of the condition is rather foreign to the subject under consideration.

Musser divides pain into "peripheral," due to some disturbance affecting the nerves or nerve roots; "central," when the lesions are on the brain; and "general," which includes that pain depending on toxic conditions of the blood or disturbances of the nervous system on a whole, the disturbance showing itself as pain in regions of least resistance. While this no doubt represents a natural division of the subject, its value in diagnosis is questionable, as the nature of the disease frequently requires to be ascertained before it is possible to classify the pain.

Any classification of pain as to its quality is unsatisfactory, and the association of certain kinds of pain with definite states of disease, while possible in some cases, is not of general application. Description in as simple language as possible, and the adjectives boring, stabbing and aching, are sufficiently expressive of the patient's sufferings.

The *mode of onset* has to be considered, and in general the sudden or

gradual onset are proportionate to similar states of disease, though there is naturally no invariable association in either case with the severity of the affection.

The *duration of pain* and its intermittent, remittent, constant or periodic character, is of distinct importance in diagnosis, though here as well no absolute rule can be formulated.

The *time of occurence*, with reference to the various periods in one's daily cycle, are often of great value, especially so in disease of viscera having periodical functions, as the stomach or bladder, when pain may be the most diagnostic of all the symptoms present.

The *degree or intensity* of the painful sensation does not furnish any definite information, as individuals vary immensely in their susceptibility to pain, in the actual distress experienced, and in their manner of showing it; nor does the intensity of the sensation indicate a proportionate severity of the affection producing the pain. Usually, however, if the pain is extreme in its severity a serious condition is indicated; but the reverse by no means holds true, and a very malignant disease may exist with a minimum of actual pain.

The *modification* of pain by pressure, movement, rest and so forth, also furnish a certain amount of information.

Location modifies both the character and degree of pain, an inflammatory disturbance in a dense structure like bone exhibiting a greater degree of pain than would be experienced in a more lax tissue. The typical stabbing or cutting pain of pleurisy bears no close resemblance to the pain in osteomyelitis, but typical phonomenon are rather against the rule, in the science of medicine; so that it is quite possible for any different anatomical structures to show confusion in their painful manifestations.

So far we have been considering platitudes, and the process has been rather indefinite.

In the *New York Medical Journal* (Vol. 69, 1870), pain is studied from a clinical standpoint by W. H. Thompson, where he endeavours to classify it according to its etiology, stating that much may be learned of the cause by an intelligent observation of the patient's gestures in describing his malady. The idea is easily understood, as an individual who has an acutely inflamed knee joint will be much more diffident in the manner he handles the part than he would be were he suffering from muscular rheumatism.

As his first division he takes inflammatory pain, and defines it as being increased on pressure, having the maximum intensity at the seat of the inflammation, being increased on movement and interfering with the normal function of the part.

All these factors, however, cannot be appreciated in every instance, though usually sufficient will be present to give an indication of the condition causing the disturbance. The fact of such pain being increased on pressure is taken advantage of in differentiating spasmodic from inflammatory affection of the bowels. That the pain in inflammation is always maximum at the seat of the disease may be restricted with the proviso, when pressure is applied. Appendicitis, in which pain is a very prominent symptom, is by no means definitely localized at first, though subsequently it is felt in the region where the morbid process is taking place; and anyone who has suffered from a severe toothache, the result of an ulceration or abscess, is well aware that the severest distress may be experienced in parts quite remote from the original disturbance. Tenderness on pressure is also not diagnostic of inflammation, as Hilton shows in differentiating an inflamed from an irritable ulcer, and he adduces an increase of heat in the part as the pathognomonic symptom.

The next variety of pain in this classification is that produced by pressure, and the continuous character and wide radiations are the chief distinguishing features of such a derangement. One would naturally expect in the subjection of any nerve trunk to direct pressure to have some manifestation of the disturbance in the peripheral distribution of the filaments but any pathological process in sensory nerves devoted to painful sensations in their continuity, might also show the pain in regions from which they normally convey stimuli.

Derangement of function, which is regarded as one of the chief diagnostic points in inflammatory pain, may occur in certan regions of the body and notably the brain, when subjected to pressure, and quite easily may be confused with an inflammatory process; and when both obtain at the same time, the possibility of ascertaining the cause definitely, other things being equal, is problematical.

Stretching pains, illustrated by colic and sprains, form the third division. The special characteristic is the suddenness with which such are ushered in; and another quality of this class is the associated superficial tenderness, which is especially marked in the case of sprains.

Other affections with a totally different causation may set in with very sudden pain, and biliary and nephritic colic have often been mistaken for appendicitis or *vice versa*; but in the absence of other definite symptoms, an appreciation of the spasmodic character of the pain may be of distinct value in classifying the ailment.

Neuralgic pain forms the fourth division of the subject, and although varying very much in its manifestation and intensity, it is characterized throughout by its intermittency. By the term neuralgia we usually understand a painful affection of the nerves associated with tender points

in their course. Thomson, however, discards this definition and subdivides neuralgia into febrile and toxic.

Now, febrile, and toxic and non-toxic all show intermittency in their manifestations. Under the first heading he includes the indefinite pains of fever, under the second the pains of any chronic poisoning unaccompanied by fever, such as lead poisoning or Bright's disease. The non-toxic form may be due to the irritation of a nerve by some foreign body, and may also be represented by angina pectoris and the painful crisis in tabes dorsalis.

What advantage such an exhaustive classification, depending for its existence on one feature common to all, will afford in the recognition of disease, does not appear very evident; as it is reasonable to suppose that other states of pain may also show an intermittent character.

Subjective pains, as seen in hysteria, are very various, and get recognition by their fleeting character, and possibly in many cases by the extreme superficial quality of the sensation.

Frequently they afford the only means in diagnosing the psychosis, though the possibility of error is great, and hysteria can simulate almost any painful disease.

Cutaneous reflex pain forms the last division of the subject. This was first described by Head, who applied the name to pain which could be elicited on the surface of the body in disease of the viscera, the painful points being brought out by lightly touching the cutaneous surface with some blunt instrument, definite skin areas corresponding to definite organs. Head has prepared elaborate charts showing the seats of this reflex pain in internal disease. Its absence indicates nothing; so that, taking into consideration the complicated charts and the one-sided information obtainable, it does not appear at all probable that the medical student will add a roll of colored charts to his stethescope as an aid in physical diagnosis.

The general value of a classification such as Thomson furnishes, one can readily appreciate, but it is obvious that all pain cannot be limited to one particular division, and it is natural to suppose that the pain experienced in many diseases, may depend on a variety of circumstances.

For the purposes of description, diseases may be more or less roughly divided, according to the manner they manifest or do not manifest pain.

In the first place, there is a certain number of affections not necessarily presenting common pathological lesions, which do not show pain as a primary feature, and it is not till the disease has progressed to such an extent that complete resolution or cure is impossible, that pain occurs, though even pain, as we understand it, may not be present throughout the whole course of the disease. Carcinoma and sarcoma form the most

valuable examples of this class, but almost any pathological process of the organs, if sufficiently chronic, may be unattended by pain, and it is for some functional disturbance that the physician is first consulted. No absolute rule, however, can be formulated, and it is plain that the location of the nerve growth and its relation to nerves, will determine to a great extent the existence of pain, so that in some cases the pain may be severe at an early stage. In many diseases of the nervous system, pain is absent, though not invariably, and when present is often of great value in determining the nature and extent of the lesion.

The absence of any reaction to painful sensation is pathognomonic of syringomyelia, although in the classical onset of the disease, there are irregular pains.

The second class includes in a general way acute affections and acute systemic disorders, in which pain is usually present from the onset, but only incidentally, so to speak, the severity of the other symptoms leading us to expect a sensory disorder. Anyone will have noticed how much acute infectious disorders, whether local or general, resemble each other in the onset, and pain in the back and legs may be ascribed to a symptom more or less common to all. Naturally such a symptom present in so many diseases will furnish no diagnosis beyond referring the condition under investigation to a general class of ailments, but which is frequently more easily affected by the other symptoms present. Headaches are also a manifestation of pain common in acute disturbances, but their causes are so manifold and their location and character or quality vary so widely, that a separate consideration would be necessary to do justice to the subject.

In small-pox, influenza and dengue, this initial pain is especially marked, and in small-pox, "Severe pain, chiefly in the lumbar region, accompanied by severe frontal headache and vomiting, justifies precautionary measures in an epidemic before the eruption is present" (Osler). The most prominent symptom of influenza is usually the general soreness of which its victims complain, and dengue has obtained the name of "break-bone fever," on account of the pain in the muscles and joints and its severe boring character in the bones.

Although the disturbance be of very great severity, it does not furnish sufficient evidence for a definite diagnosis, as these affections may not manifest pain to such an extreme degree, and also the geographical locality or presence of an epidemic must be considered. Moreover, other fevers in certain individuals may show an exaggerated condition of their usual onset. Acute inflammatory disorders of some of the viscera, such as the kidney, may show a certain amount of accompanying pain, which occasionally is very suggestive.

The third class is that large number of diseases or derangements in which pain is the only symptom present, and it is here that a proper estimation of the variety of pain present, and an accurate knowledge of the distribution and connections of nerve trunks affords almost the only menas of diagnosis. Hilton says, that if a patient presents himself to a surgeon complaining of pain in any region of his body, and there is no evidence of any cause by any other symptoms, the surgeon should ask himself, what association of nerves will explain the pain. And he lays down the axiom, "that pain felt in any part must be accounted for by the nerves of that part." Also, he further states that by following centripetally the nerves supplying the part, the cause of pain may be ascertained. As an example of this, and one familiar to all, he mentions spinal caries, where one of the earliest symptoms present may be pain in the arms, epigastric or hypogastric regions, depending on the site of the morbid process, whether cervical, dorsal or lumbar, and obviously due to some disturbance of the nerve roots with a peripheral manifestation in pain.

The existence of girdle pain or bilateral and symmetrical pain would also imply a bilateral state of disease, and furnish more or less reliable information as to the extent of the pathological condition. So also the presence of pain in the auditory canal may exist quite apart from any local lesion, but the cause will be found in some other part of the distribution of the fifth nerve. Such pain is fairly frequent in malignant disease attacking the side of the tongue, and most of us are unfortunate enough to know that an aching tooth may cause very severe earache.

In regions like the head, where there are several distinct nerves supplying parts in close apposition, the exact location of pain is naturally very important.

Another common example is the pain experienced at the knee in hip-joint disease, but there are so many other examples that the general idea is all that is required, an accurate knowledge of anatomy furnishing a fair guide for most cases.

Another class of referred pain and differing slightly from the foregoing, is seen in the pain occasionally experienced in the tips of the shoulder, which occurs in affections of the pleura, intrathoracic growths and notably in liver disease, and is probably explained by the connections of the phrenic nerve with the third and fourth cervical nerves, which have a distribution to the cutaneous surface over the shoulder.

Pain between the shoulders and spreading over the inferior angles of the scapulæ, often attributed to rheumatism, is frequently an indication of disease of the stomach, and by considering the connections of the fourth, fifth, and sixth dorsal nerves, which are distributed in that region,

with the great splanchnic nerve through the ganglia above the sixth and the splanchnic distribution below, a reasonable explanation of the distant disturbance is afforded.

Hilton arbitrarily divides the back into three divisions; first, high up between the shoulders, where pain is felt in disease within the thorax; second, between the middle and lower parts of the scapulæ, where disease of the digestive viscera is manifested in pain; and thirdly, the surface in the lumbar region, where pain is associated with local disease in the loins, and disease of the ascending and descending colons, kidneys, ureters and testicles.

The old teleological idea, as expressed by Hilton, that this superficial manifestation of pain in internal disease was a merciful dispensation of Providence, to enable us to recognize pathological states in our internal economy, must give place in the light of general application, and our present state of knowledge, to the view held by James Ross in his paper "On the segmental distribution of sensory disorders," (*Brain*, Vol. X.), viz., that this cutaneous referred pain may be explained in point of locality, by considering the changes in position which take place in some organs, in the development of the human organism. In studying the disturbances in sensation caused by disease of the viscera, he draws attention to the fact that pain may be present on the surface of the body, and in some cases over the affected organ, while in others in parts more or less remote, and that these areas correspond with the primary position of the organ.

This peripheral manifestation he terms somatic pain, in contradistinction to the deep-seated indefinite pain, which may exist in diseased conditions of the viscera. This cutaneous pain may be the only symptom of any severity present in many cases, and a knowledge of the various seats of somatic representation may materially aid in making a diagnosis. In diseases of the lungs and pleura, in pneumonia, for example, there may be pain in the part affected of a full, deep-seated character, but pain is also frequent in the mid-sternal regions, and in pleurisy, while the pain may be most noticeable over the seat of the disease, pain in the abdomen is quite frequent, as a result of pressure on the inter-costal nerves in their course, and pain may even be present on the side of the chest which is not involved by the disease.

The somatic manifestations indicative of heart disease may be precordial, extend to the left shoulder, and radiate down the corresponding arm. When present, this is sometimes of value in determining cardiac affections, but Broadbent remarks, that when a patient complains of pain over the heart, it is usually fair presumption of the absence of disease.

A patient at the General Hospital this year complained of pain very

similar to cardiac disturbance, but affecting the right side and arm, and which was more suggestive of a growth to the right of the median line of the thorax. On examination an aneurism of the ascending aorta was found projecting well to the right, and evidently disturbing the cardiac plexus of that side or the phrenic nerve, giving rise to the pain in the shoulder and arm.

Pain is frequently the sole manifestation of angina pectoris, and the agonizing quality of the disturbance may be the only means of differentiating it from a neurotic condition.

The absence of pain, however, indicates nothing, or rather is of no diagnostic value in the more common affections of the heart, as in an analysis of 482 cases of valvular disease, pain was present in 127 cases only (Not hægel).

Inflammatory affections of the pericardium also may exist without showing any sensory disturbance, contrary to a very general rule, that acute conditions of serous membranes are painful, while similar states of mucous membranes are comparatively painless.

In disease of the stomach pain may be felt over the seat of the organ or referred to the chest and back, and is a fairly frequent accompaniment of gastric disturbance, though its manifestations need not conform to the characteristic expression one might expect from the pathological process at work.

Inflammatory states, if severe, are usually recognized, but in the functional disturbances, motor and secretory neurosis, many of which show pain, the pain will usually be found to bear some relation to the kind of food ingested or to the time of day corresponding with the physiological variation in the stomach contents. Gastralgia, on the other hand, may bear no relation to food or time, and render confusion with other disorders more probable, especially so as this condition may be both symptomatic or idiopathic.

Diseases of the liver and gall bladder have their somatic distribution in the right hypochondrium, extending to the inferior angle of the scapula. Liver disease only incidentally gives evidence of its existence in pain, and biliary colic is often the only symptom we have in disease of the gall bladder.

In an old number of the *Lancet*, a medical man, who had been a constant sufferer from biliary colic, states that after having carefully observed his own symptoms and the symptoms of others similarly affected, he had arrived at the conclusion that severe pain beginning about the tenth or eleventh dorsal vertebræ, passing around the body to the right or left hypochondrium and lower abdomen, and radiating to

the right nipple, but never higher, was pathognomonic of an inpacted bile stone.

Difficulty, however, still exists in the absence of other definite symptoms in distinguishing such a condition from gastralgia, perforation or acute pancreatitis and possibly the gastric crisis in tabes.

An infract of the spleen may show pain from the resultant peritonitis, and disordered states of the bowel may give evidence of disease by more or less pain in the lower regions of the back. Pain is, of course, present in peritonitis and intestinal obstruction or strangulation, but the additional symptom of vomiting furnishes us with the most reliable information.

In disease of the kidney, the pain in the back or loins, which occasionally occurs, is to a certain extent useful but the radiation of pain down the inguinal and genitocrural nerves to the testicle in disease of the pelvis and ureter is very suggestive.

Pain from bladder disease varys very much with the cause, both in the region in which it is felt and with regard to the time when experienced, and stone, cystitis or prostatitis will give a different character and position to the pain.

The testicle has areas of referred pain in the veins and along the ilio-inguinal nerve, but very fatal disease of that organ may exist without any local disturbance.

The female organs of generation in general show somatic pain in the left lower quadrant of the abdomen, and on the back of the socrum, but the nervous connections of these organs are so intricate that pain may be experienced in parts of the body so remote, that it is frequently necessary to regard these manifestations as due to a debilitated state of the whole nervous system.

It is perfectly evident that there are many other localities, apart from those mentioned, where pain may be significant of disease; and the association of tender points with many injuries may often afford valuable information; but after even a most minute consideration of the existence of pain in disease,

There will always exist a class of cases where pain is the only symptom and to which no restricted rule can be applied, and it is here that the application of Hilton's axiom, "that pain felt in any part must be expressed by the nerves supplying the part," will be the only aid.

Pain whenever present, must be regarded as an important symptom but its value in determining the nature of the pathological process is practically limited to the inflammatory variety, though the other kinds will show the mechanical cause of the disturbance.

In an article of the *Lancet* of 1859, which considers a number of

cases of disease showing pain as the sole symptom, pain is regarded as an important symptom, "when it exists without an assignable cause, continues without early evidence of disease, and its locality is not defined, when its removal is not affected by medical aid, when local examination does not add to its severity and when the general condition is not at first affected," probably pain conforming to all these conditions would be a more important symptom from a surgical point of view with the possibility of clinching the diagnosis by an exploratory laparatomy, but it is very doubtful whether any final-year man would care to have as his first patient, one who showed no other symptom than pain.