The Canada Lancet

VOL. XL. OCTOBER, 1906 No 2

THOUGHTS ON A DECADE IN MEDICINE.*

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DR. REEVE, after fittingly expressing his thanks for the honor conferred upon him, modestly disclaimed the thought either in dreams by day or visions by night that it would ever come to him. He could not, however, but feel that the success of the Montreal meeting was warrant for this venture, but frankly avowed that any credit for such success as may attend the second visit of the British Medical Association to Canada—and the prospects were bright—must rest largely upon those who have freely given most valuable help in various ways. It had been indeed a labor of love to bring from their posts of duty and busy round in the old home land the select and the elect of the profession. He greeted them not only for their own sakes as men whose names were already household words, or doubtless soon would be, but as worthy sons of worthy sires. For if Bacon, Shapespeare, Newton, Faraday, Kelvin, Clerk Maxwell, J. J. Thomson and other lights of literature, science and philosophy in the British firmament were blotted out there would only be a partial eclipse, for would not Hunter, Harvey, Sydenham, Jenner, Simpson and Lister present a resplendent galaxy?

The gathering was in a sense a cosmopolitan one. International comity had always prevailed in the profession; disease knows no distinction of country or race, and is the common lot of humanity. In the face of an ubiquitous foe it was natural that mankind should be as a unit in defence, and that the confraternity of the healing art should be undivided. The recognition of English talent and experience on the part of the late Emperor of Germany, and by the British sovereign in the case of that master of the science and art of bacteriology, Koch, and the action of the United States in calling to its counsels British experts in tropical medicine upon the threatened invasion of yellow fever, were graceful and forcible proofs in point. And they were glad in obedience to the unwritten code and by means of this gathering to cement the tie that already binds the great Anglo-Saxon people and those of the lands of professional culture and erudition, France and Germany.

* An abstract of the Presidential Address before the 74th Meeting of the British Medical Association August 21st, 1906.

Our confreres from United States delight to honor the names of Physick and Rush, Wood and Warren, Biglow and Bowditch, Alonzo Clark, Flint, Weir Mitchell and others, and yet I am sure they are not one whit behind the Briton of Britons here to-day in their respect for the great men of the British school from Harvey to Lister, who have laid the world under tribute. We in turn delight to honor Laennec, Bichat, Corvisart, Trosseau, Charcot, Pasteur, Vals, Langenbeck, Virchow, Billroth and Koch.

The association, which had met for the second time in its history outside of Great Britain and Ireland, was founded in 1832 in Worcester, England, and had a membership of 140. It was reorganized in 1856, and took its present name. It now has a membership of 20,000, grouped in many divisions and branches in the old country, and in various parts of Greater Britain. There were present an honored member from Egypt and one from New Zealand.

Dr. Reeve, in reviewing the history of the association, complimented the *British Medical Journal* as forming a strong bond of union among the members.

"The editor may well felicitate himself upon the weight of its influence in moulding public opinion and in safe-guarding the interests of the profession. Those who recall the crusades of the anti-vaccinationists and anti-vivisectionists will agree that the journal is at once a faithful sentinel and a doughty champion."

While time did not permit to trace the growth of the organization, the President called attention to one incident of the first meeting which explained much of the valuable work done in years which have intervened. Steps were taken to secure special studies on anatomy and the chemistry of the animal fluids, and the researches on those subjects reported at the second annual meeting were the first of a long series made under the auspices of the association, which has so far given of funds about $70,000 to meet in part the expense involved. This feature of the association's work formed a bright chapter in her history, and was in marked contrast to the apathy and lack of support of the Government, whose attitude in this regard had often to so many seemed unintelligible. Nothing seems more certain than that money spent in such a cause yields a thousand fold return.

He then reviewed the progress made in medicine during the last decade. Many years were surely compressed into the decennium in which Lister and Pasteur, Koch, Metchnikoff and Behring, with genius and untiring energy in quest of the truth, solved their mighty problems and gave the world such talismanic words as antisepsis, asepsis, immunity and serum therapy. The result had been princely gifts

in the interests of science and humanity, and the various laboratories that now existed marked the dawn of a brighter era. There was much to be done ere the millennium came. Nursing had become a fine art, diphtheria had been largely robbed of its terrors; the mortality of typhoid had been reduced one-half, but the fatality of cancer had largely increased; the white plague stalked through the land and the death rate of infants, owing mostly to intestinal troubles, was still very high and not on the decrease. One might surmise with what surprise old Hippocrates would rise and enquire if there were any sickness left, but the hoary sage would possibly not know that the masses of mankind require to be protected against themselves. As an example, at Jenner's centenary, the city where his method of vaccination had come into vogue was in the throes of an epidemic of smallpox, due to the ignoring of his great discovery. There was yet ample scope for state medicine to ply its persuasive powers until men thought aright about matters which affected the well-being of the community, and the presumed welfare of the individual should not stand against the weal of the masses. But it would seem in the matter of vaccination people deliberately closed their eyes to the plain force of facts, and cherished the delusion that "it were better to bear the ills we have than fly to others we know not of." Compulsory vaccination seemed a harsh and doubtful expedient, but what it had done in Germany it could do the world over, and the dictates of wise prudence and the lessons of ample experience showed conclusively that it should be enforced. Done under the rules of asepsis, as it always should be, and with the use of pure vaccine, now always to be had, the risk was practically nil.

The work of the decade had given the profession itself some new ideas in regard to the mechanical and chemical processes of digestion. That the first part of the stomach is a mere receptacle and the second part a kind of "mill," which is perforce the more common seat of mischief requiring surgical treatment, had been established. Time has served to emphasize the value of thorough mastication, and the necessity of the avoidance of mental states which would divert nervous energy, and interfere with the digestion by cutting off the appetite juices had been shown by Pawlow's studies.

A notable work was that by Chittenden, of Yale, on "Physiological Economy in Nutrition." Too much food not only meant loss of vitality in the disposal of it, but a positive risk from the resulting poisons (toxins) ere these products of metabolism are finally disposed of. Chittenden showed that one-half or one-third of the nitrogenous foods ordinarily taken would suffice, and with a minimal tax upon liver, kidneys and digestive tract. Much of the joy of life depends upon a good diges-

tion, and in these days of wear and tear and carking care the less of useless work to be done because of faulty diet the more of energy to spare for life's duties. He emphasized the importance of a fuller knowledge of dietary standards. It was safe to say, too, that with less proteid food, less uric acid would be formed. And while rheumatism was due to the agency of a special microbe, the congenial soil for its operation might be greatly reduced. There should be some boon for the legion of rheumatic subjects, for while not so deadly as the white plague, rheumatism caused more pain and misery than tuberculosis. The question of nutrition concerns all mankind and the right food for infants and adolescents was of more moment than that for adults, and the wise physician will not forget that the young were more apt to err in ignorance and to be sinned against, while older folk are wont to transgress in spite of light. It will be well when the teachings of the laboratory and college halls have become common property. There will be then more plain living and high thinking, and less repining on the part of the masses on account of their enforced moderation. It is the prerogative of the profession to show that nature's laws, rightly interpreted and adopted, are the only safe guide to good living, not men's whims, fads and fickle appetites or ingrained habits, and that much of the money spent for patent goods and patent medicines (so-called) are, as a rule, mis-spent. Thirty-five per cent. of all deaths are under five years, and a large proportion of infants and other very young folk who die would be saved if properly fed. Proper food and hygiene are the hope of future generations.

The importance of furnishing clean, pure milk to communities as one of the greatest boons to humanity and the good service of the pediatric societies in the United States was recognized, and there was a great field for missionary work by the profession. There were many infants' foods, and not a few of these good ones, but there were some which were not; some so-called meat extract had little nutritive value, and the need of care was shown by the warning of Sir Thomas Barlow, given in 1894, that "condensed milk, or even sterilized milk, is not an efficient substitute for the natural food of the infant, and that infantile scurvy may be caused by their sole use." And animals have been found to rapidly die when fed on a mixture of all the supposed constituents of milk. There is an "unknown quantity" even here.

The past decade had been marked by an increase in the debt medicine owes to physiology and physiological chemistry and by a sense of the growing importance of the latter. It would be strange if these relations were ignored, since, as Prof. Newell Martin pointed out, three great advances in medical thought had been due to researches in physi-

ology and biology. These were that disease was the result of a change in the structure of material constituents of the body leading to abnormal action, the establishing of the cell doctrine, that each one of us is made up of millions of little living units, and the germ theory as to the causation of an important group of diseases. To the last we owed antiseptic surgery and the development of bacteriology. Nothing was really known about inflammation before the experimental researches of Lister, Virchow and Cohnheim, and all known about fever was built on researches of Claude Bernard. Ludwig had also remarked that a great proportion of the physiological work of Great Britain had been done by successful hospital physicians and surgeons. This proper sequence had been kept up in the person of Sir Victor Horsley, who gained well earned repute in physiology before he won his spurs as one of the leading surgeons of the day.

Professor Osler, to whom Ludwig addressed his remark, on the other hand, was an illustration of a physician of the highest order, who first made his mark as a physiologist.

Twenty years ago the cry was raised that there was too much science and not enough of professional training in the medical course. The speaker doubted if it were the sentiment of to-day, and expressed the opinion that the time spent by the student at science proved of lasting value, keeping him in touch with the scientific side of medicine and putting him on a higher plane through life.

Empiricism had its day and was not yet over, and no doubt the forefathers of the profession gave the race good service, and none was more ready to pay them tribute than he whose researches and experiments had given him the right to speak with authority. With the more exact knowledge of the causes and nature of disease had come more faith in the native powers of the human body, and was perhaps the reason why one who was the peer of any in the science of medicine had said that the advanced school valued a few well-tried medicines as highly as ever, and the modern treatment of disease relied largely on the old "natural" methods—diet and exercise, bathing and massage. It would seem that practical medicine, insofar as drugs were used, had not quite kept pace with the knowledge of the causes and processes of disease, but per contra, sera were drugs and the diphtheria antitoxin had wrought a magic not seen since the days of the great Healer Himself.

That pneumonia is always a septicæmia and its specific microbe always present in the blood gives the clue to its prevalence and high mortality—greater indeed than of yore, doubtless owing to the large and increasing percentage of dwellers in cities and towns. A protective and curative serum or "vaccine," as in the case of diphtheria or typhoid, is the

hoped-for remedy. The discovery of a specific microbe in cerebro-spinal meningitis, its mode of entrance by the nose and throat, and of the trial of repeated lumbar punctures and injections of diphtheria antitoxin with uncertain results, are features of interest in this serious malady, which, by the way, is not as fatal as some suppose. The discoveries that typhoid and malaria infection were carried by flies were reviewed.

Of great interest bacteriologically was the discovery by Wright and Douglass of the substances in the blood fluids called opsonins, which prepared typhoid microbes for ingestion and digestion by the leucocytes, and that the serum acts upon the microbes. By the vaccine, prepared from cultures of the typhoid bacilli, sterilized by heating at 60 degrees centigrade for ten or fifteen minutes and injected internally, a modified immunity for two years at least was secured. This method had been tried on the British troops in India and South Africa, and commended by the Secretary of War after a careful study of results.

The clue to the cause of yellow fever and successful measures toward the eradication of malaria had followed the discovery by Major Donald Ross that malaria was conveyed by mosquitoes. The first proof that the stegomyia was the carrier of an infecting agent of yellow fever was given when Carroll, in July, 1900, offered himself for a test experiment. He had a narrow escape, but Lazear, of the American Commission, and Myers, of Liverpool, lost their lives. The labor and deaths of these men were not in vain, however, as was attested by the vigor and success with which the plague was stamped out and the exemption secured by Havana and other pest centres.

Preventive medicine as the result of this decade's work alone gave sure promise of saving more lives and sparing more misery than could universal peace. To give effect to its benign sway was worthy the highest ambition of the greatest statesman.

In commenting for a few moments on surgery, he said it was still the important question, when to operate. At the congress in Washington some years ago the physicians took a rather aggressive stand in regard to appendicitis, while the surgeons favored caution, but now the attitude was reversed. Manual deftness and operative dexterity were no longer a passport to fame. More than ever, possibly, surgeons must be much more than mere surgeons; they must study carefully the processes of disease and the effects of injuries. The elder Chiene of Edinburgh some years ago struck the keynote when he said his clinical laboratory was the first essential in his armamentarium. Surgeons now studied the blood and counted the white blood corpuscles to get the clue they required. Surgery is now invading, if possible, more vital

spots, such as the heart, and indeed their respected friend, Sir Victor Horsley, gets down very close to the medulla oblongata. The x-ray is now giving the surgeon and the pathologist better data than ten years ago.

Reference was made to the efforts of Dr. Roddick to secure a common standard of registration for the Dominion. The hope was expressed that the Roddick Bill would soon come into operation by all the provinces adopting its provisions.

In closing, the growth of the medical association was compared to that of some mighty tree, whose record was written in annular rings on its trunk. If it showed scars, showing the hand of the faithful pruner, giving strength and better fruitage to the other portions; if there could be seen branches of other sorts grafted into the essence of its life, it would still not only be a thing of beauty, but would live and grow to be a joy forever.

THE CIRCULATION VIEWED FROM THE PERIPHERY.*

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MR. President, Ladies and Gentlemen,—In the first place I must thank you, and through you the whole British Medical Association for the high honor which has been conferred on me in my appointment to deliver this address. This is an honor and a privilege which happens to very few men, and that only once in a lifetime. I feel the dignity of the office and the obligations which it entails all the more deeply inasmuch as the invitation in the first place came from the members of the Association resident in this city. When the invitation was conveyed to me I rather hesitated to undertake a task which I felt I could only inadequately perform, but, on the other hand, I looked upon the request as a command, and it seemed to me that I could scarcely refuse to undertake a duty for which I had been selected by my Canadian brethren.

After accepting the task my difficulties began, and my first was in choosing a subject which would have a more or less general interest.

It finally occurred to me that I might find some devious path or unbeaten track in the vast field of medicine which I might pursue with some measure of success. I intuitively turned my attention to the circulation, the ramifications of which pervade the whole field, and as

* Abstract of address in Medicine, delivered at the 74th Annual Meeting of the British Medical Association.

writers hitherto on this subject have almost invariably traced the circulation from the centre to the periphery it occurred to me that we might get a fresh view if we turned our attention in the opposite direction.

I have previously asserted that diseases of the heart most frequently arise from causes acting on the periphery, and hence there is here no room for specialism. The man who only studies the circulation with the aid of a stethoscope is a positive danger to society. I can, therefore, with an easy conscience and a sense of much satisfaction devote some attention to that periphery.

The capillaries through which the interchange of nutritive pabulum and gases takes place between the blood and tissues, play a most important rôle in the animal economy. Yet they have received very inadequate attention from clinicians. Perhaps it has been thought that their structure and position could be so briefly described that any circumlocution in their description was unnecessary. But however simple their structure, and however apparent their functions, they constitute a vast filter bed for conveying nutritive material and oxygen to the tissues and for removing waste products therefrom. They are to a certain extent elastic, or at least they have the capacity of adapting themselves to the amount of blood which is driven through them. Their importance has been aptly described by Leonard Hill, who says: "The blood is brought into intimate relation with the tissues by diffusing through the endothelial wall of the capillaries, and this wall is of great tenuity; thereby takes place that change of material which maintains the combustion of the body and the fire of life."

The capillary bed is a vast territory which pervades every tissue and organ of the body, and so numerous are these little vessels that it would be difficult to stick the point of a needle in any vascular area without wounding one or more, but in neurotic individuals you may wound many such vessels without drawing blood. In very plethoric individuals and in cases of polycythæmia the capillaries of the body are fairly replete, but in ordinary mortals, especially in those of neurotic temperament, perhaps not a third of the capillaries are full at any one moment. Apply a sinapism to a very pallid skin, and you may wonder where all the turgid capillaries have sprung from. From the fact that under normal circumstances a sufficient quantity of blood cannot get through the arterioles to keep the enormous capillary bed full, the lateral pressure and the velocity in the capillaries are ever-varying quantities. When Leonard Hill stated that the pressure in the capillaries under certain conditions is often over 100 mm. of mercury, I thought that there must be some error of observation, as I was under the impression that such

pressure would rupture these delicate little vessels, but I remembered the old advice; Do not think; try. I tried, and found that Leonard Hill had rather understated the fact, as I found variations from about 50 to 2,000 mm. of water. I also found equally great variations in the velocity of the blood in the capillaries. In textbooks on physiology it is put down from 0.2 to 0.75 mm. per second, but my observations have given records from about 0.5 to 25 mm. per second. The higher the potential in the arteries the greater the velocity in the capillaries, but as this arterial potential is induced by obstruction to the outflow the velocity in the arteries will be diminished. As Leonard Hill appropriately says: "The circulation of the blood follows certain definite laws; unfortunately, the conditions of the flow are so complicated that these laws remain for the most part undetermined. A viscous fluid driven by an intermittent pump which circulates through a system of branching elastic tubes of varying capacity, a system of tubes into and out of which passage of fluid takes place either by osmosis, filtration, or secretion; a fluid which varies in viscosity, a pump which varies in force, and tubes which have an ever-changing diameter and coefficient of elasticity."

I have long been in the habit of estimating the velocity by compressing the blood out of the capillaries in a given area and then watching the quickness or velocity of the return. This has served, and still serves my purpose, but when I wish to record my observations I use a glass rod 10 millimetres in diameter. With the flat end of this rod I compress the capillaries, and then with a stop-watch recording fifths of a second I time the period of the return of the blood. If you divide the radius of this rod (5 millimetres) by the time, you get the velocity per second. For these observations you must select some spot where there is a network of capillaries which you can completely empty, such as those in the back of the hand or the finger, and you must also choose a spot where the return current flows from all parts of the circumference. As before stated, I have recorded capillary pressures varying from 50 to 2,000 mm. of water, and my velocity records have ranged from about 0.5 mm. to over 25 mm. per second. Any one with a capillary velocity at the level of the heart which physiologists set down as normal might appropriately take up the refrain, "The hour of my departure's come."

The study of the lateral pressure and velocity of the blood in the capillaries is an exceedingly interesting one. A combination of these two forces represents the energy of the blood in the capillaries, and no doubt this energy is derived from the heart, and stands in direct relationship to the force of the cardiac contraction; the greater the force of the cardiac output the greater will be the energy in the capillaries, but the component elements of this energy—lateral pressure and velocity—need not bear any direct relationship to those respective elements in the

arteries. These two conditions (velocity and pressure) might be said to stand, within certain limits, in an inverse ratio to one another, the more rapid the flow the less the lateral pressure, and *vice versa*. The lateral pressure depends on the statical condition of the blood, and just in proportion as you introduce movement you convert the force of pressure into that of velocity.

The pressure stands in direct relation to the freedom of the inflow, and the obstruction to the outflow. For example, take a very cold hand: the arterioles and small arteries may be so contracted that the mass of blood supplied to the capillaries is greatly diminished, and the lateral pressure correspondingly falls. Even in the arterioles there may be such a drop in the pressure-gradient that there may be a difference of 50 mm. of Hg between the lateral pressure in the digital artery and that in the radial. In cases of local syncope the lumen of the arterioles supplying the affected district is obliterated and the capillary pressure is reduced to nil. On the other hand, if you warm the hand, or take a glass of whiskey which dilates the arterioles, the mass of blood in the capillaries is augmented and the pressure rises, and the fall in the pressure-gradient between the arteries and capillaries becomes more gradual. An increasd obstruction in the arterioles over a wide tract, such as the splanchnic area, raises the general arterial pressure and lowers the capillary pressure in the area supplied by the contracted arterioles.

I have corroborated v. Kries's observations as to the effects of gravity on the capillary pressure, and like him I have found that the increase is usually less than one-half the hydrostatic effect. It largely depends on the condition of the vasomotor mechanism of the part which you are examining. If the arterioles be contracted and the inflow to the capillaries be obstructed the increase may not be a third of the hydrostatic pressure, but if the arterioles be much dilated the increase may be half or even two-thirds of the increase which has taken place in the artery. Leonard Hill has pointed out to me that this increase chiefly takes place when the limb is immobilized; and when active movements are going on the blood is compressed out of the capillaries and this increase in the lateral pressure does not take place. There is, however, under these conditions an increased hydrostatic pressure in the arteries, as Leonard Hill was among the first to demonstrate, and this must be expended in the arterioles and capillaries either in the form of increased pressure or augmented velocity.

Some people are very liable to cold feet in bed. In such cases the part may be fairly comfortable before going to bed, but once the horizontal posture is assumed the arterial pressure and capillary velocity fall, there is not a sufficient amount of fuel carried to the extremities to keep the large cooling surface warm. Here the defect is in the initial

energy, and besides improving the general arterial pressure it would be advantageous to keep the feet much lower than the head and shoulders.

The velocity of the blood in the capillaries is, if possible, even more interesting than the pressure. It varies enormously in different individuals under different conditions. As I have before said, the range of my observations has been from less than 0.5 to 25 mm. per second. We shall now consider the conditions under which these variations occur. In the first place it depends chiefly on the potential in the arteries—the higher the arterial pressure the greater the velocity in the arterioles and capillaries. High arterial tension drives the blood through the arterioles and capillaries with great velocity, but certain little corrections have here to be borne in mind. If the arterioles of a small area, such as the hand, be contracted, the general arterial blood pressure is not affected; the blood travels in the direction of the least resistance, so the supply to the hand is diminished, and although the capillary pressure is diminished the velocity is not increased—in fact, the diminished supply spread over a large capillary district should tend to lessen the velocity.

When the arterioles are dilated in any area, as at the commencement of an inflammation, the whole of the capillaries are opened up and engorged with blood, and with this increased mass the pressure is raised, but the velocity is also heightened owing to the arterial potential remaining high and the resistance in the enlarged capillaries being diminished. We have seen how hydrostatics affect the pressure in the capillaries, but the velocity is much more uniformly affected.

When a warm hand is hanging the velocity in the finger is greater than in the back of the hand, and if the relative position of these parts be altered the velocities are reversed. I purposely said a warm hand, because in a cold hand the capillary circulation in the fingers is often very languid. After removal of an Esmarch's tourniquet the capillary velocity in the flushed area is considerably augmented.

Any obstruction to the outflow from the capillaries diminishes the velocity in them. The hydrostatic effect of the blood in the veins would materially obstruct the capillary flow only for the provision of valves, and the muscular compression hastens on the blood and thus diminishes the statical condition. However, certain capillaries, such as those of the liver and kidneys, are exposed to considerable backward pressure when from any cause the venous pressure is raised.

When the velocity in the capillaries is reduced to one millimetre or less per second the blood becomes surcharged with carbonic acid and the skin or organ supplied becomes of a dusky hue. This appearance immediately disappears if you increase the capillary velocity; for example,

when the hand is blue and passively congested from cold, or the so-called local asphyxia, if you let it hang down you increase the velocity and you quickly see bright red spots intermingled with surrounding lividity, and soon the color of the whole hand improves. In the cold livid dependent hand the color of the fingers is better than that of the back of the hand. When you get cardiac failure, with or without any obstructive lung disease, you frequently see the upper part of the body and the hands quite dusky, while the legs and feet, which are at a lower level may be pale. In one marked case of cardiac failure where the upper part of the body was livid, I saw one foot and part of the leg in a state of local syncope and as pale as marble. These patients do not require a cylinder of oxygen, with which they are frequently plied, but the judicious application of a little common sense, such as the intravenous injection of small doses of adrenalin or some cardiac tonic. In cases of Raynaud's disease the local syncope is ascribed to vaso-motor spasm, but really the spasm, if it exist, is a very mild affair. In these cases the arterioles shut down because there is not sufficient blood pressure to keep them open. The arterial pressure is always low, and the blood is deficient in lime salts and viscosity. In the cases of local asphyxia the arterioles are not closed, but the arterial potential is low, the velocity in the capillaries is defective, and the *vis viva* is not sufficient to drive on the blood stagnating in the veins. In cases of erythromelalgia the reverse happens; the velocity and pressure are both increased in the large engorged capillaries.

In many cases of pneumonia with low blood pressure, the vasomotor taps in the splanchnic area are all open, and the aorta is drained before it terminates in the iliac arteries; the bulk of the blood is retained in the chest and abdomen, and the quantity supplied to the lower limbs is diminished. Moreover, the extremities are often colder than the body, and the arteries contracted. The lower level of the limbs increases the velocity in the capillaries and veins, and consequently the capillaries of the foot and leg are often blanched and the veins comparatively empty when the upper part of the body appears congested and purple.

Viscosity of the Blood.

The viscosity varies greatly, and is no doubt the great cause of resistance in the capillaries. Normally it is about five times that of distilled water, and Dr. John H. Watson, in association with Dr. A. du Pre Denning, has found that in many diseases the viscosity is nine or ten times that of distilled water. The coefficient of viscosity in the tarry blood of Asiatic cholera is often so great that it will not pass through the capillaries. Dr. Graham Brown and others have found

that a rise in temperature lessens the viscosity, and hence a febrile temperature lessens the resistance and so diminishes the work of the heart, but it does not follow from this that a high temperature in fever is an advantage, as there are many more efficient ways of lessening the viscosity. As the velocity diminishes the blood becomes more charged with CO_2, which enlarges the red corpuscles and further increases the viscosity. It has long been a disputed point as to whether the resistance to the arterial flow, and consequently to the heart, is situated in the capillaries or arterioles.

Sir W. H. Broadbent, I believe, even now throws the weight of his deservedly great name in favor of the resistance being in the capillaries; and in cases of vasomotor paralysis no doubt such is the case, but in ordinary circumstances I agree with the majority that there is an earlier barrier to the outflow from the heart in the arterioles and small arteries which are governed by vasomotor nerves. This can be readily proven by the fact that there is very little fall in the pressure-gradient from the large to the small arteries. The pressure in the radial and tibial at the same levels is as great as that in the brachial and femoral. When you come to the very small arteries and arterioles which are offering resistance to the flow there is a very great fall in the pressure and an increased velocity. Now, if the capillaries formed the first line of resistance the fall in the pressure-gradient would be much more gradual, and high arterial pressure would be associated with high capillary pressure, but we know the reverse to be the case.

It is extremely fortunate that there is this first line of defence created by the action of the vasomotor nerves in the small arteries and arterioles, because if this were wanting, as at present constituted we should either have to go about on all-fours or constantly run the risk of fatal syncope. Moreover, the blood would gravitate into the most dependent parts, the cooling surface would be enormous, the capillary velocity would be diminished, the blood would become surcharged with CO_2, and we would become cold-blooded animals.

In cases of vasomotor paralysis the arteriolar resistance to the cardiac outflow is transferred to the capillaries and then the fall in the pressure-gradient becomes more gradual, proving that the resistance was not a question of viscosity, but gradual failure in driving power to overcome the total resistance. The venous pressure was low as well as the capillary, showing that the heart was rapidly failing (though doing its utmost) and had not sufficient energy to overcome the capillary resistance. By this wonderful vasomotor mechanism a large amount of the cardiac energy is stored up in the arteries as potential, and is converted into kinetic energy in the arterioles and capillaries.

In the second line of resistance there is a greater transformation of energy. If there be very little resistance in the veins a large proportion of the kinetic energy is carried right through to them, but as far as the resistance to the outflow has to be overcome the velocity is converted into pressure. There is considerable waste or rather transformation of energy in overcoming resistance and in producing filtration pressure. In these small tubes there is an enormous amount of surface friction. It also varies directly as the viscosity. The extravascular pressure is about one-fourth of the capillary pressure from which it is derived and is an important force in carrying on the lymph circulation.

The viscosity is an important element in the resistance; we have already seen how it is increased by CO_2 and diminshed by heat. The work of Professor A. E. Wright has shown that it is increased by the salts of calcium, magnesium, and strontium, and diminished by decalcifying agents such as citric acid and the salts of potassium, ammonium, and sodium.

We have already referred to the viscosity in connection with the resistance in the tubes or the surface friction, but the mobility of the fluid or the surface friction of the molecules of the fluid against one another increases the resistance. The force of the heart is used up in propelling on the blood, and of course the mere weight of the blood and the viscosity must use up a great part of this force. The blood is a very viscous fluid and its viscosity is much increased by an excess of corpuscles.

Burton-Opitz, quoted by Watson, has found the viscosity increased by nitrogenous diet and by alcohol. Watson has found the viscosity diminished in chlorosis, but this must be more than counterbalanced by the great increase in the plasma and the total increase in the corpuscles, which Lorrain Smith has shown to exist in this disease. The viscosity is diminished, but the total weight of the fluid to be driven is enormously increased, consequently the heart hypertrophies.

In polycythæmia, as Professor Osler has said, "It is especially important to test the viscosity of the blood by accurate physical methods, and to determine the relation of the number of corpuscles to the viscosity." This has been done by Watson and by Parkes Weber, and they have found that viscosity can be more than doubled, and is in direct proportion to the number of corpuscles.

Burton-Opitz, Fano and Rossi found that thyroid secretion lessens the viscosity. Watson concludes his observations in the statement: "The influence, therefore, of the viscosity of the blood is not an independent but a dependent variable whereby its effect upon the work of the heart may be diminished or increased."

There can be no doubt that the viscosity is an important element in determining the work of the heart; but, as a clinical factor, its importance can be easily overrated, as there are other simpler methods of determining the condition of the capillary circulation, and we must remember that the living capillaries are more or less elastic, and offer much less resistance to the flow of blood than would be caused by rigid tubes of the same calibre. On the other hand, the great variableness of the capillary pressure and velocity makes their interpretation often a matter of some difficulty.

The Interchange of Material Through the Capillary Walls.

In a network of capillaries the pressure must necessarily be higher in the efferent or distributing vessels connected with the arterioles than it is in the afferent or collecting tubules which unite to form the venules. You can thus have filtration and absorption going on side by side. The fall in the pressure-gradient in the capillaries must be fairly uniform from arteriole to venule; but as there is usually a considerable fall from the capillaries to the veins there must be a corresponding difference between the efferent and afferent capillaries, and thus transudation and absorption in different parts of the same network can be readily explained. In the intestinal capillaries the larger and deeper vessels supply the secretory structures, and the smaller and more superficial vessels are the absorbents.

The interchange of gases which are in solution readily takes place by the process of diffusion; and osmosis must play a very important part in transudation and absorption according as the osmotic equivalent is greater on one side than the other of the capillary membrane. In 1886, when dealing with the pathology of dropsy, I said: "Fluids pass very readily through organic membranes, such as the walls of the capillaries, by a process of osmosis, but albumens do not thus readily transude. Unlike the capillaries of the lungs and kidneys, the systemic capillaries allow albumen to pass through their walls, so that it is found in all the intercellular fluids. Now, if it does not pass through by osmosis, we must suppose it to be filtered through under varying amounts of pressure. In filtering under pressure, as a rule, the greater the pressure the greater the amount of the filtrate, but the composition of the latter differs very materially from the nature of the compound fluid submitted to the pressure, as the different constituents pass through with varying degrees of ease, the water passing through much more readily than the albumen. Hence, although the total amount of albumen passed through may be increased according to the quantity of the filtrate, its

percentage is diminished. Hence, the greater and more rapid the production of dropsy—if there be no increase in absorption—the less the relative amount of albumen."

On this score you cannot do better than adhere to the teaching of Professor Starling, who says: "In fact, we may say that the formation of lymph and its composition, apart from the changes brought about by diffusion and osmosis between it and the tissues it bathes, depend entirely on two factors: (1) The permeability of the vessel wall; (2) the intracapillary blood pressure. So far as our experimental data go, we have not sufficient evidence to conclude that the endothelial cells of the capillary walls take an active part in the formation of lymph."

The Arterioles and Capillaries of the Skin.

The arterioles are well endowed with muscular fibre and vasomotor nerves, chiefly of the constrictor type; frequently they are so contracted that the capillaries are almost empty, and in cases of local syncope quite empty, and the pressure and velocity fall to zero. When the vasomotor nerves are paralyzed from a central cause the capillaries are full, their pressure increased, and the velocity diminished. When paralyzed from a local cause—such as mustard poultice—the capillaries are engorged and the pressure and velocity increased. Witness also the effects following the application and removal of an Esmarch's tourniquet. These little vessels are reciprocal to those of the splanchnic area, are largely concerned in regulating the temperature of the body and in maintaining the general arterial pressure.

The capillaries form an exceedingly close network in the corium and send loops up into the papillæ. The pressure and velocity vary enormously. After a liberal meal—especially one containing ingredients which dilate the arterioles, raise the diastolic arterial pressure, and thus provide an abundant supply of blood to, with increased pressure in, the capillaries—there is a free outpouring of lymph. In my opinion, a good deal of the work which has been done on the so-called digestion leucocytosis has been rendered worthless by the work of George Oliver on the tissue-lymph circulation. This so-called digestion leucocytosis is, therefore, no evidence of any increase of white corpuscles in the circulating blood, but merely that lymph has been pressed out from the vessels, and in this lymph there is a considerable number of lymphocytes, probably obtained from the tissues rather than from the capillaries. There is, no doubt, a digestion leucocytosis, but it is not what has been described.

The Arterioles and Capillaries of the Splanchnic Area.

These arterioles are very muscular and well supplied with vasomotor nerves. These nerves are the chief regulators of the arterial

blood pressure. The capillaries are very fine and form an extremely close network. The resistance to the outflow is very slight, except in cases of portal obstruction, hence the velocity is usually great and the lateral pressure slight. This is just what would be expected in vessels where absorption is an even more important function than secretion. Those capillaries which are given off earlier are the largest, and go to supply the secreting structures of the glands, while those which approach the surface of the mucous membrane are much finer, consequently the velocity in them is much greater and the lateral pressure less. This is where absorption takes place.

The Capillaries of the Liver.

The capillaries of the liver are short and wide, measuring 0.5 to 1 mm. in length and about 10 to 13 micromillimetres in diameter. The velocity is often so slow that the liver is of a dull purple color, and the pressure is relatively but not absolutely high. The liver capillaries are very permeable, and, as has been shown by Professor Starling, give rise to a free secretion of concentrated lymph. This is in accordance with the observations of Runeberg and of myself that the concentration of the filtrate is greater at lower than at higher pressures. Professor Starling has also shown that the lymph is also increased by any obstruction to the outflow from the hepatic veins. In the large nutmeg livers, induced by positive intrathoracic pressure and regurgitation through the tricuspid orifice, the capillary pressure is increased and the velocity diminished. In the early stages of hepatic cirrhosis, while there is an increased exudation and fibrosis along the portal vessels there is also marked congestion of the central lobules due to cardiac asthenia, dilatation of the tricuspid orifice, and increased venous pressure, the results of chronic alcoholic intoxication. At this period the liver is enlarged from hepatic congestion, and it is only later that the contraction of the newly-formed fibrous tissue leads to diminution in bulk. The liver acts as a reservoir for the right side of the heart.

The Arterioles and Capillaries of the Kidneys.

The arterioles are very muscular and well supplied with vaso-constrictor fibres, and thus while these nerves contribute to raise the general arterial pressure, they protect the capillaries of the glomeruli from any excessive pressure; thus high arterial pressure increases the velocity in the glomeruli, but not necessarily the lateral pressure. The glomeruli are further protected by the endothelial lining of Bowman's capsule, and are not easily permeable to albumen, but readily allow the transudation of water and salts. Moreover, the glomeruli are protected in

ordinary circumstances from any backward venous pressure by the second set of capillaries into which the efferent vessels divide. In cases of orthostatic albuminuria there is defective vasomotor action in the whole of the splanchnic area, the kidneys are congested in the erect posture, and moreover the blood is deficient in lime salts as has been shown by Professor A. E. Wright, so the albumen more easily permeates the walls. Here, with the lessened velocity and lowered pressure, the concentration of the filtrate is increased.

The same local conditions occur in a more marked degree in inflammatory disturbances in the kidneys. We have seen that only a fourth or less of the capillary pressure is transmitted directly to the surrounding tissues in which they are imbedded, but in some pathological states the whole brunt of the arterial and capillary pressure is transmitted, and woe betide any organ when this pressure is long continued. In those large, congested, chocolate-colored kidneys, when the capsule is stretched to its utmost capacity, and the kidneys are nearly twice their normal weight, the transmitted pressure of the arteries and capillaries stops all secretion. The only salvation for such kidneys and their possessor is to freely excise the capsule and kidneys, as has been ably and persistently advocated by Mr. Reginald Harrison. When the pressure is relieved the secretion is at once re-established. This is a purely physical effect, and may occur in any organ where the limits of its expansion are exceeded. I have felt a big spleen pulsating in my hand till I thought it was going to burst; in this case the transmitted pressure was arterial. An inflamed gland often pulsates.

In granular kidneys the glomeruli are further protected by the increased thickness of Bowman's capsule; the velocity is much increased and the pressure only relatively so; the filtrate is bulky but not concentrated. There is nocturnal diuresis because in the horizontal posture, although there is a fall in the general arterial pressure, the arteries of the kidneys are dilated, and the total amount of blood circulating through them increased.

The Arterioles and Capillaries of the Muscles.

The arterioles are supplied with vaso-dilator nerves, and thus these vessels are reciprocal to those of the splanchnic area. The capillaries are arranged in a fine longitudinal network, and readily allow of the transudation of lymph. When there is a rise in the general arterial pressure these vessels are flushed and allow a free secretion. Dr. George Oliver has shown that during the height of the digestive flow of lymph, tension exercises of the muscles do not further raise the arterial pressure. The lymph in the limbs is not concentrated and is readily absorbed.

The Vessels of the Spleen.

The vessels of the spleen are well supplied with vasomotor nerves, and the whole organ seems to have the power of contracting and of thus regulating its own blood supply. Adrenalin has a powerful effect in producing contraction.

The Cerebral Vessels.

The arteries and arterioles have relatively thin walls in proportion to their calibre. The inner coat is well developed; in the middle coat there is a moderate amount of muscular fibre but the elastic tissue is defective; the external coat is attenuated, and ceases before the muscular coat disappears and the arterioles pass into the capillaries. The external coat is composed of connective and white fibrous tissue with longitudinal striation, and there are no elastic fibres. Robin described a lymphatic sheath over the arterioles, which strengthens them and helps to supply the place of the defective adventitia.

These vessels are not very contractile, and take no part in regulating the general arterial pressure. Owing to the stress and strain to which they are frequently submitted they are very liable to atheromatous and calcareous degeneration of the internal coat, and thickening or periarteritis of the external coat; there are also frequently small miliary aneurysms. Physiologists, as a rule, do not admit that these vessels possess any vasomotor nerve fibres, but Dr. Alexander Morison says that he discovered their presence; if so they must be very scanty, and perhaps only serve a trophic function. There is not a very great amount of muscular fibre on which they can act, and adrenalin does not cause any contraction of these vessels, of the coronary, or pulmonary arteries, as has been shown by Schäfer, Dixon, Brodie, and Elliott. The capillaries are small, short, well-supported vessels, which seem to be able to bear a considerable amount of strain, as Leonard Hill has shown that sometimes the pressure may be at zero and at other times when the head is down it may rise to 1000 mm. of mercury. This latter condition must, however, be rather exceptional, as the carotid arteries have great contractile power. Professor MacWilliam has shown that post mortem the carotid can be easily made to contract to half its former diameter, and any one can easily satisfy himself that as to the great variations which occur in life. Under these circumstances the circulation in the brain becomes largely kinetic, the velocity is enormously increased, but not the lateral pressure. The cerebro-spinal fluid is very deficient in proteid, from which we may infer that under ordinary circumstances the capillary velocity is relatively great and pressure slight. In cases of meningitis the proteid in the cerebro-spinal fluid is increased.

The Coronary Vessels.

The arteries and arterioles which supply the heart closely resemble the cerebral vessels in being thin-walled, rather deficient in muscular fibre, and in having very few, if any, vasomotor nerves. They are also exceedingly prone to atheromatous and calcareous degeneration of the intima. Newell Martin, Roy and Adami, and Alexander Morison have found some evidence of vasomotor nerves, but on the other hand Schäfer, Dixon, Brodie, and Elliott have failed to get any response to adrenalin which acts on all muscular fibre innervated by the sympathetic. The portions of the arteries which are not subject to muscular compression, and which consequently are constantly under the strain of the aortic pressure are very liable to degenerative changes, but the terminal portions of the arteries which are imbedded in muscle are not, as a rule, much affected. So when a coronary is blocked the heart may be supplied with blood from the venous side. In cases of stenosis of the tricuspid orifice the coronary veins are often much dilated, and form regular sinuses in the cardiac muscles.

The Pulmonary Circulation.

The pressure in the pulmonary artery is not more than one-third and the velocity of the blood about three-fourths of those respective conditions in the aorta; but, unlike the vena cava, the pressure in the pulmonic veins is always positive, so that the blood always enters the left side of the heart under pressure, while it is usually sucked into the right side. There is a gradual fall of the pressure-gradient from the right ventricle to the left auricle, and there does not seem to be much resistance to the circulation either in the arterioles or capillaries.

Bradford and Dean, and Francois Franck have shown by a series of very elaborate experiments that the pulmonic vessels are innervated; but while such innervation may be sufficient to maintain slight tone in the vessels, the experiments with adrenalin, to which I have before referred, which show that it cannot constrict the vessels so as to effectively increase the resistance.

The experiments of Lichtheim showed that the greater number of the branches of the pulmonary artery could be ligatured without lessening the input into the left heart or lowering the aortic pressure. But Cohnheim showed that this end was attained by increased work on the part of the right ventricle as demonstrated by the increased intraventricular pressure, and once this ventricle began to fail there was a sudden fall in the input to the left heart, and in the aortic pressure. Any diminution in the pulmonary vessels, such as occurs in pneumonia and in emphysema, increases the work of the right ventricle, but so long as

it is able to meet the demand, the circulation is maintained. It is the failure of the right ventricle which is the principal cause of death in pneumonia. The pulmonic arteries are fairly well endowed with muscular fibre, and even after death have a considerable power of contraction so as to drive the blood right on through the capillaries into the pulmonic veins.

If formaldehyde, which firmly clots the blood, be injected down the trachea after death, there will often be found firm thrombi in all the pulmonary veins, but not in the pulmonic arteries. It is, therefore, highly probable that any nerves which the pulmonic vessels may possess merely maintain the tone of the vessels or have a trophic effect. In cases of mitral stenosis the intrapulmonic tension is raised throughout, and atheromatous changes are as common in the pulmonic veins as in the arteries.

Respiration renders great assistance in carrying on the circulation to the right side of the heart, and to a less extent to the left; that the assistance extends to the whole circulation is shown by the fall in the arterial pressure which occurs at the beginning of inspiration. In the so-called *pulsus paradoxus* (there is no paradox, but merely an exaggeration of a perfectly normal phenomenon), and in Müller's experiment of expanding the chest with the glottis shut, the pulse may disappear at the wrist. This is due to the sudden emptying of the veins to fill up the vacuum in the chest, and with this removal of the obstruction to the capillary flow there is a simultaneous depletion of the arteries. It is not due, as has been supposed by Kussmaul, to any kinking of the large vessels, nor to any sucking back of blood into the aorta as has been imagined by those who seem to have forgotten that the pressure in the aorta is always high and cannot be affected by a negative pressure in the thorax. It is due to a certain fall in pressure affecting the veins, capillaries, and arteries, and it is most marked in cases of low arterial pressure. When the arterioles are much contracted and the arterial tension high, as in cases of Bright's disease, it does not occur. The lungs form a blood reservoir for the left side of the heart, and during this expansion the reservoir is increased and has to be filled up before the left side of the heart is sufficiently well supplied with blood to enable it to throw the proper quantities into the aorta at each systole, the arteries are therefore emptied at their distal end and not filled at their proximal end and so the pulse disappears until an equilibrium is restored. I recently had a very good example of this in a case of bradycardia under my care where the frequency of the pulse varied from twelve to twenty-four beats in the minute.

When Dr. John Hay, and my house-physician, Dr. Jones, were taking cardiographic and sphygmographic tracings I found that when the

patient took a long deep breath and then held his chest expanded as long as possible, the following events occurred :—

During the deep inspiration there were two beats of the heart and two pulses at the wrist, then the pulse disappeared in the carotid, brachial, radial, and femoral arteries, and remained absent for several beats. At the same time the impulse of the heart disappeared, and the clear loud first sound and systolic murmur were replaced by a low, dull-toned, obscure sound, and the second sound was not audible. After four or five faint systoles, which I attributed to the right ventricle, the clear first sound and systolic murmur, and the double second sound reappeared and were associated with a return of the pulse in all the arteries. Here undoubtedly the blood was stored up in the lung reservoir, and the proper systoles of the left ventricle and the pulse in the arteries did not reappear until the reservoir overflowed. He had several attacks of semi-consciousness and one slight epileptic seizure during the periods of suspended breathing with the chest expanded. These attacks always occurred after the pulse had ceased for about twenty seconds.

Circulation in the Tissues.

In 1904 Dr. George Oliver showed that during the first hour of digestion there was a rise in the blood pressure—arterial, capillary and venous—with a flow of lymph into the tissues; during this wave there might be a difference of 10 to 20 per cent. in the number of erythrocytes and hæmoglobin betwen the mixture of blood and lymph obtained by a simple prick of the finger, and that of the pure capillary blood obtained from the same prick after the lymph had been compressed out of the finger.

He also showed that the same extracapillary lymph flow occurred in the muscles and prevented any further rise in the arterial pressure from tension exercises. His observations led him to the following conclusions: "(1) That the food constituents themselves (proteids, fats, and carbo-hydrates) do not possess the power of starting the mechanism by which lymph is dispensed to the tissues through the body. (2) That Nature, however, associates with our foodstuffs small quantities of very active substances which bring into play that mechanism, though these substances themselves are practically devoid of food value, and that man frequently increases this natural lymph by the use of salt and beverages containing bodies which also incite the flow of lymph. Such bodies as uric acid, creatin, creatinin, xanthin, glycogen, and sodium chloride perform an important function in nutrition, for during digestion they act as distributors of lymph to all the tissues—an office which the nutrient constituents themselves (proteids, fats, and carbo-hydrates) are incapable of discharging."

Dr. Oliver associated the action of these lymphagogues with a rise in capillary blood pressure, but in 1891 Heidenhain had ascribed the action of such agents to a specific excitation of the secretory activities of the endothelial cells. We have before referred to the careful experimental work of Starling in 1893, by which he refuted the conclusion of Heidenhain, and re-established the doctrine of filtration under pressure.

The pressure in the capillaries is usually higher than that in the veins because their sectional area is greater and there is greater friction, but if the arterioles be much contracted, a tenth or even a twentieth of the capillaries may not be filled with blood, and the sectional area of those may fall even below that of the vessels collecting the blood.

When a person is standing the venous pressure in the foot is raised, but so also is the arterial. In the healthy individual the arteries of the lower limbs are firmly contracted, and although the pressure is high the mass of blood on which it acts is relatively small, and consequently the energy in the capillaries is largely converted into velocity. In proportion as you obstruct the outflow from the capillaries you increase the lateral pressure and diminish the velocity in them, and consequently increase the transudation. In cases of vasomotor paresis and in cases of cardiac failure the mass of blood in the capillaries of the dependent limb is augmented, the pressure is increased, and the velocity is diminished; consequently you get œdema.

The Veins.

The veins are smooth, capacious vessels, which practically offer no resistance to the circulating blood. They contain a certain amount of muscular fibre, and are supplied with some vasomotor nerves, which maintain their tone and to some extent regulate their capacity. The great strength of the veins depends on the strong fibrous external coat. They are slightly elastic and attain their maximum distension at a low internal pressure; in this respect they differ essentially from their corresponding arteries. The veins have very flaccid walls, and consequently readily adjust their cubic space to the amount of blood in transit. It has been shown by MacWilliam and by Leonard Hill that veins contract on mechanical stimulation or by cold, and dilate by heat. The coefficient of elasticity increases with the internal pressure.

The Pressure in the Veins.

The lateral pressure in the systemic veins depends on three factors which it would be well to consider separately: (1) The obstruction to the inflow to the chest; (2) the hydrostatic effect of the column of blood, and (3) the potential energy transmitted through the capillaries.

1. During inspiration there should be a negative pressure of a few millimetres of mercury in the systemic veins of the chest, and from this there is a gradual rise till you reach the smallest vessels collecting the blood from the capillaries, and of course the pressure in these vessels will largely depend on the hydrostatic pressure due to their posture. During expiration there is a positive pressure in the veins of the chest, and this is further increased when there is any obstruction in the lungs such as arises from emphysema, pneumonia, or bronchitis, or in the heart as may arise from pulmonic or tricuspid obstruction or regurgitation, pericarditis with effusion, cardiac failure, etc. This obstruction tells backward throughout the whole venous system to the capillaries, but its effects are more immediately felt in the liver, and it often gives rise to transudation into the pleural sac. In epileptic or tetanic convulsions there is great obstruction to the entrance of blood into the chest, while the high arterial pressure keeps the lungs engorged by damming back the blood, drives the blood on through the capillaries, and thus raises the venous pressure.

2. The effects of the hydrostatic pressure in the veins of the limb would be very great only for the fact that they are well supplied with valves, and the muscular compression of the vessels drives the blood onwards, thus lowering the venous pressure and diminishing the obstruction to the outflow from the capillaries. If there be a negative pressure in the chest the venous pressure at the level of the vertex should be practically *nil*. Therefore, when the body is in the horizontal posture and the foot raised to the level of the head, the pressure in the veins of the dorsum of the foot may be at zero, but when a person with large varicose veins and defective valves in the veins at the lower extremity is erect the pressure in the dorsum of the foot may rise to over 100 mm. of mercury.

3. The pressure transmitted by the blood moving through the capillaries. This is a very variable quantity, and largely depends on the amount of blood and the energy which it retains in its passage from the arteries through the capillaries. If the quantity be great and the capillary pressure high the venous pressure is raised, but if the quantity be small and the velocity great in the capillaries the blood in the veins may still retain much of its kinetic energy. In the veins the viscosity of the blood and the friction against their walls are practically negligible quantities. The energy of the blood in the veins is also variously compounded of pressure and velocity; the greater the obstruction to the flow into the chest the greater the pressure and the less the velocity; and the greater the freedom in the flow the more is the *vis a tergo* converted into velocity.

In the portal vein the pressure is always positive, and in this respect it resembles an artery.

Velocity in the Veins.

The blood in the veins is one of the very few things which runs more quickly up the hill than it does down it. The velocity depends on the *vis a tergo* and varies enormously; in the veins of the arm it is frequently five times greater when the arm is hanging than when it is held horizontally at the level of the shoulders. The velocity is calculated by emptying a long piece of vein between two valves, and then timing with a stop-watch the period it takes the blood to fill the empty vein. I have seen 23 cm. of a vein in a dependent arm filled in 0.2 of a second, or a velocity of 115 cm. in the second, a velocity as great as often occurs in the aorta. As in this case viscosity and friction can be left out of account, the only resistance to the flow was the retarding influence of gravity which can be easily calculated.

The Arteries.

It would be quite out of place to this audience and to the larger audience which I hope to reach, to describe the constitution of the arteries, but for the clear comprehension of the physics of the circulation it is rather important to emphasize some difference betwen the aorta and its branches. The aorta and the commencement of its principal branches differ from those of smaller calibre in the enormous amount of elastic and white fibrous tissue which almost completely replace the muscular layer of the middle coat. The external coat is very strong, and is composed of white fibrous tissue and longitudinally disposed elastic fibres, while the internal coat, like that of the other arteries. is divisible into three structures. When we pass down to the small arteries and arterioles, the muscular layer is relatively better developed, and the external tunic gradually lessens, and before the capillaries are reached finally disappears.

The constitution of the respective arteries depends on the functions which they have to perform. The arteries, especially those of large size, are well supplied with nutritive vessels, the *vasa vasorum;* and, with the exception of those previously specified, are richly endowed with vasomotor nerves; and it is largely due to this influence that the arterial tone is maintained.

As the blood leaves the heart its energy is largely kinetic, and therefore there must be very little lateral pressure at the commencement of the aorta during ventricular systole, but if the aorta be healthy a large

portion of this energy is rapidly stored up in the elastic walls as potential which is paid out during the diastolic period, and then the blood is compressed with a force nearly equal to that which it exercised, and this applies to all portions, including the commencement.

The velocities of the blood in the aorta and pulmonary artery vary considerably in different individuals, and in the same individual under different conditions. The velocity is directly as the cardiac energy and inversely as the resistance to the outflow and the sectional area. The force of the right ventricle is not a third of that of the left, but the resistance is also not a third of that in the systemic vessels: the sectional area is only slightly greater, therefore the velocity in the pulmonary artery is nearly equal to that in the aorta.

In my opinion physiologists place too low an estimate on the velocity of the blood in the aorta, though no doubt their conclusions are based on many careful experiments, but experiments very difficult to carry out and very liable to great fallacies.

You must bear with me while I explain these questions of velocity and pressure in the aorta, because a clear comprehension of them is essential for any true knowledge as to how stress and strain produce atheromatous and sclerotic changes in the vessels.

There is no more important subject in the whole domain of medicine, as, after the age of 50, arterio-sclerosis, directly or indirectly, kills more people than any other disease.

As the semilunar valves open the blood has acquired its velocity head, and then the actual velocity depends on the energy or effective head minus the resistance to the outflow; in the aorta the viscosity of the blood can be left out of account. The velocity between any two points depends not on the pressure but on the difference in the pressures. In a healthy aorta the energy is rapidly stored up in the elastic walls during systole and paid out during diastole, thus making the pressure and velocity more or less uniform. The most perfect circulation is one with a small difference between the systolic and the diastolic pressures—a moderately low systolic and a relatively high diastolic pressure in all the arteries. The systole of the ventricles gives out the energy during a third of a cardiac revolution, and the perfection of the circulation depends on the disposal of that energy not only during the time that it is given out, but also in the interval between the systoles. The diastolic pressure is more than sufficient to overcome all the resistance in the circulation; if it were not, the circulation in the main arteries would come to a standstill towards the end of the diastole. You can therefore look upon the difference betwen the systolic and diastolic pressures as that part of the

energy which is not stored up in the walls of the arteries and which is engaged in producing velocity. I usually think that when this difference exceeds 40 mm. of mercury there is something wrong with the elasticity of your aorta and it is about time that you began to think about reparing the damage.

When you get a continuous lateral pressure of 200 mm. of mercury or more there is no period of repose for the vessels, but merely periods of greater or less distension; there is interference with the circulation in the nutritive vessels, the *vasa vasorum*; you get irritative and proliferative changes in the subendothelial layer of the intima, atheromatous and perhaps calcareous degeneration follow, and the elasticity of the aorta becomes impaired. Oskar Klotz says that all the aortas examined by him coming from persons over 25 years of age showed more or less calareous change in the aortic wall. In proportion to the loss of the elasticity the energy of the heart is not stored up, and with the loss in the conservation of energy the heart has got more work to do in order to carry on the circulation, and a great disparity arises between the systolic and diastolic pressures.

In these cases the immediate resistance to the outflow from the heart is not increased, but the total work is greater, the diastolic pressure in the heart rises, and the ventricle dilates and hypertrophies. The output is increased, the velocity is increased, and longitudinal straining—especially along the greater curvature of the arch of the aorta—takes place. You may now get a difference between the diastolic and systolic pressures of 120 or 130 mm. of mercury or more.

This gives rise to a marked recoil of the heart at the end of the systole, and to negative and positive waves in the circulation which obstruct one another. When failure begins to set in, you may find the force of this big powerful organ which shakes the whole chest only poorly represented at the periphery. In these cases the storage is defective, the pressure and the velocity are more or less intermittent, and there is an enormous waste of energy. In cases of very free aortic regurgitation the difference in the pressure gradient, and consequentlv in the velocity, is often very great, the cardiac hypertrophy becomes extreme, and subsequently failure rapidly takes place.

This question of storage forms an important element in prognosis, and for this reason aortic regurgitation occurring early in life from a rheumatic lesion when the aorta is fairly healthy is, *caeteris paribus*, very much less serious than a similar lesion arising secondary to degeneration of the aorta. If there be any elasticity left in the aorta and principal branches, there is an advantage in aortic regurgitation in

maintaining a relatively high diastolic pressure, because you thus make circulation more uniform, and you do not necessarily raise the systolic pressure or increase the work of the heart. For these reasons well-regulated doses of digitalis and squill often do an enormous amount of good in this disease, notwithstanding the fact that many well-recognized authorities have entirely condemned the use of digitalis in aortic regurgitation, possibly because they did not know how to use it.

While a combination of these drugs increases the peripheral resistance—which is an advantage if moderate in amount—they lessen the size of the ventricle, increase the length and completeness of contraction, diminish the residual blood, and thus lower the diastolic pressure in the ventricles. In estimating the condition of the aortic wall in these cases some valuable evidence is furnished by the ear, because if there be any delay in the transmission of the pulse wave the aorta is still fairly elastic. You must always be careful to distinguish between the velocity of the blood and that of the pulse wave. With the former, the greater the resistance, the higher the diastolic and the lower the systolic pressure, the less the arterial velocity of the blood; but in the case of the pulse wave, the greater the resistance, the higher the diastolic pressure, the more rigid the arterial wall, and the greater and more rapid the energy of the ventricle the quicker the transmission. The rigidity of the arterial wall may either depend on the atheromatous and calcareous degeneration with loss of elasticity, or on an increase in the coefficient of elasticity due to high blood pressure; in both cases the velocity of the pulse wave is increased. The velocity of the blood in the smaller arteries is inversely as the cross section, and need not here further detain us, as it will be best considered with the pressure-gradient. In the present day it is a very common, and occasionally beneficial, practice to combine cardiac tonic with vasomotor relaxants, such as digitalis and nitro-glycerine, but before combining opposing forces I think it is always well to have a clear indication in your mind as to the objects which you wish to accomplish, and the results which are likely to be attained. The circulation of the blood is one of the most perfect pieces of mechanism in the universe, and no amateur should be trusted to keep it in repair, yet American and English people pour tons of baneful drugs down their throats every year on the recommendation of advertising quacks, who care nothing for the lives and health of the community, and care for nothing but their money.

Arterial Blood Pressure.

The arterial pressure at the level of the heart depends on the force of the cardiac systole and the resistance to the outflow through the arterioles and capillaries. With a healthy heart or self-regulating pump

the greater the resistance the greater the force of the cardiac contraction, and consequently the higher the lateral pressure on the walls of the arteries. If the resistance be too great, we may get cardiac failure, and then the pressure falls. A long-continued great resistance increases the work of the heart, and work leads to hypertrophy, which maintains the pressure at a high level. In a healthy aorta the coefficient of elasticity increases with the internal pressure, but long-continued strain impairs the elasticity and leads to degenerative changes in the intima.

Professor MacWilliam has shown that the behavior of an artery under varying degrees of internal pressure depends on the state of contraction or relaxation of the vessel, and on the relative amount of elastic and muscular tissue. A strongly contracted muscular artery resists internal pressure, and the maximum distension does not occur until very high pressures are reached, while in a completely relaxed artery and one containing very little muscular fibre, the increase in volume is greatest at low pressures. Similar conclusions were deducted from his experiments on the pulsatile expansion of arteries.

"In the intact arteries of men and animals there would be much less pulsatile expansion in a contracted artery than in a relaxed one; and in a relaxed artery expansion would be very much more extensive when the mean blood pressure is low. Further, elongation would occur markedly in the relaxed artery as compared with the contracted one. And when a long stretch of artery is concerned the increase in length is very much greater than the increase in transverse diameter."

I have arrived at the same conclusions from my observations on the pressure-gradient; wherever there is relatively a great disparity between the systolic and diastolic pressures you get marked expansion in the arteries; when the arteries and arterioles are very relaxed and the diastolic pressure low, as in the hyperdicrotic pulse, you get extensive expansion; but even under these conditions if the systolic output be slight the expansion is not great, so we are driven back to the conclusion that even in a relaxed artery the amount of expansion depends on the fall in the pressure-gradient. In very contracter arteries, which are usually associated with high blood pressure, the fall in the pressure-gradient is slight and the expansion is slight. Again, I observed that a contracted artery, no matter how high the internal pressure, does not become tortuous. On the other hand, tortuous arteries are always more or less relaxed, and there is a great difference between the systolic and diastolic pressures. In these arteries there is a want of muscular tone, there is a waste of energy, they are badly nourished, their walls become thickened, the muscular tissue wastes and is partly replaced

by fibrous or even calcareous material. This is the condition which has been termed by Clifford Allbutt the involutionary form of arterio-sclerosis, but it is involutionary in development and is primarily due to want of muscular or vosamotor tone.

When a person is in the horizontal posture there is still the same pressure-gradient between the systolic and diastolic pressures, and in all the arteries of the limbs these respective pressures are about similar levels. The postural variations in pressure have been thoroughly investigated by Leonard Hill and placed on a true scientific basis. These variations are of importance not only from a physiological, but also from a pathological standpoint. In arterio-sclerotic changes, the arteries of the lower limbs are mostly involved, notwithstanding their muscular development and good vasomotor nerve supply. These arteries take part in raising the general arterial pressure, and are also subjected to additional internal strain from the statical pressure of the blood; hence both the middle and internal coats are involved in the sclerotic changes.

In arterio-sclerosis the middle coat is chiefly thickened in the muscular arteries and arterioles which take part in raising the general arterial pressure, such as those of the splanchnic area, the skin, and muscles; while in those arteries which are not very muscular and are subjected to internal strain from both high systolic and diastolic pressures the intima is principally involved. Hence atheroma and calcareous degeneration are very common in the aorta and in the commencement of its branches, and in the coronary and cerebral arteries. The carotid arteries seem to occupy an intermediate position; they are muscular and very contractile, and are not specially liable to sclerotic changes either in the intima or the media.

In my writings on arterio-sclerosis I entered very fully into the numerous causes which give rise to this disease, and the pathological aspect of the subject has been well investigated by Councilman, Cowan, Russell, Welch, and a host of others. A life of indolence and luxury is more deleterious to the circulation than the work of a navvy. I must not be supposed as recommending either course of life, but a happy mean with a strong leaning towards hard work. Sir Lauder Brunton and Dr. F. W. Tunnicliffe showed that after the cessation of musuclar contraction the intramuscular arteries dilate and thus lessen the resistance. Athletes who have had great muscular training retain very healthy peripheral vessels, but are liable to atheromatous changes in the aorta, and cardiac hypertrophy with subsequent degeneration.

Where there is continued high arterial pressure, especially high diastolic pressure, such as occurs in chronic granular kidneys, you get general arterio-sclerosis, but the lesion is more local when the high pres-

sure is intermittent. Women have not got the continued physical strain of men, but they are very liable to sudden increases of blood pressure from emotional causes which chiefly act on the splanchnic area, hence in them the aorta suffers more than the peripheral vessels. It is like the effect of suddenly turning a stopcock in a water-pipe connected with the main supply; it is the larger pipes which get the chief stress. We are not now allowed to put such a tap in a main water-pipe, but it is rather more difficult to legislate for the vasomotor system in an emotional individual. In many of these women the arch of the aorta becomes considerably dilated and the walls thin.

In assuming the erect posture from the horizontal there is not only a rise in the arterial pressure below the heart level but a fall in the arteries above, and to prevent the blood from the upper part of the body gravitating into the capacious vessels of the abdomen, the regulative vasomotor mechanism contracts the splanchnic area, and so raises the mean arterial pressure, thus syncope if obviated. There are many cases, such as Addison's disease, where there is defective action of the vasomotor nerves, perhaps from lack of their usual stimulus—adrenalin—the splanchnic vessels do not contract. and the patient cannot maintain the erect posture. In the so-called cardio-splanchnic paresis of Albert Abrams, and in cases of orthostatic albuminuria, there is a defective action in the splanchnic area, but the vessels of the skin and muscles contract and make a feeble attempt to compensate for the want of tone in the abdominal vessels. In these cases the systolic pressure is low, but there is an even greater fall in the diastolic pressure.

The Heart.

No survey of the circulation would be complete without a reference to the self-regulating pump. The heart is composed of two physiologically distinct organs—the right and left heart. Each has got its own varying amount of work to perform, and it, under normal circumstances, performs it without any assistance from the other, but in cases of stress or difficulty they mutually assist one another. They act together, and are set to the same time, but this does not prevent one side from beginning or ending contraction before the other, and so much so is the case—and they are at least to this extent independent—that doubling of both sounds of the heart is one of the most common of cardiac phenomena. In a healthy heart, both sounds are usually doubled every deep respiration.

ON THE TECHNIQUE OF OPERATIONS ON THE CENTRAL NERVOUS SYSTEM.*

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IN considering in what way I could best fulfil the extremely honorable and at the same time responsible duty of delivering the Address in Surgery on the occasion of such a meeting as this, it occurred to me that exactly twenty years had elapsed since I showed at the Annual Meeting of the Association at Brighton the first three patients upon whom I had operated at Queen Square Hospital for intracranial disease. Many of what were then regarded as special points in the technique of operations on the central nervous system are now, thanks to the work of surgeons in every part of the world, household words. The principles then advanced were chiefly based on experiments on animals. During the past twenty years further experimental research on animals and clinical observations on human beings have confirmed and extended the general soundness of the broad principles underlying the treatment then proposed.

I intend, therefore, to-night to analyze my cases at the National Hospital, Queen Square, and facts which we have gained therefrom since 1886, while from my experience at University College Hospital and in private practice, I shall only quote such cases as are unique, or particularly demonstrate certain points.

The considerable interval of time which has elapsed since the Brighton meeting has also permitted of such an accumulation of facts that important questions of diagnosis and prognosis, which were matters of much doubt in 1886, can now be more readily answered.

It will soon appear of what immense importance it is to the community that the study of neurology should be pushed forward by every means in our power in order that the earliest commencement of a tumor of the brain should be determined as certainly as one nearer the surface of the body.

But the twenty years of medical and surgical work which have passed have done more than improve our topographical knowledge of the probable seat of encephalic lesions, they have taught us from the operating theatre what previous generations had never learnt in the *post-mortem* room—namely, a great deal of the vital pathology and true anatomical nature of brain disease. *Post-mortem* records can never teach what the careful study of the living tumors exposed in an operation can demonstrate, since in almost every case the former condition is practically what we may term inoperable.

* Abstract of the address in Surgery delivered at the Seventy-fourth Annual Meeting of the British Medical Association.

I must first briefly allude to the responsibility of the surgeon in the treatment of diseases of the central nervous system. As in all special branches of medicine and surgery which are in a process of evolution, it is not easy to assign credit or blame when the course of treatment pursued is respectively successful or unsuccessful.

In 1890, hoping to secure a more logical and definite pronouncement on this fundamental point at the International Medical Congress, I proposed that in cases of Jacksonian epilepsy and other syndromata which suggested the existence of gross organic disease of the brain, a definite probationary period of medicinal treatment should be agreed upon, and that in an elementary case where no urgent symptoms like optic neuritis existed surgical treatment should be employed after thorough drug medication had been energetically applied for about six or eight weeks and cure had not appreciably resulted. No conclusion, however, was arrived at. Practically such drug treatment means mass-treatment with the iodides, combined or not with mercury.

Again, in 1893 I was unable to get an expression of opinion on this point, although Dr. Allan Starr, in his well-known work on "Brain Surgery," had also formulated the conclusion that the surgeon should be invited to consultation in the case after about three months' medical treatment had been unsuccessful. Even in the present year I have been asked to operate on a patient with a lateral tumor of the cerebellum who had been known to have optic neuritis for nine years, and last year I did operate on such a patient who had been known to have optic neuritis for thirteen years.

Palliative Surgical Procedures.

It is a prominent characteristic of intracranial disease that (1) it is liable to produce optic neuritis, which customarily ends in total blindness; (2) it may concomitantly cause severe headache and vomiting, all of which symptoms are dependent upon pressure, and can be completely palliated or wholly removed by making a sufficiently free opening in the skull and dura mater.

The first of these, namely, optic neuritis, is a condition which, owing to its causing blindness, is of such vital importance to the interest of the patient, and so to the community, that it merits full attention. In 86 its pathological causation was a matter of acute controversy, but we learnt by a very few years of operative surgical experience that, whatever other factors might be concomitant, the most important one in the production of optic neuritis was increase of the intracranial tension, and thus it happened that our earliest experience was the strikingly rapid subsidence of the optic neuritis when the skull and dura were

opened. Therefore it is now possible to dogmatize on this question, and to say that in no case of optic neuritis (not of course of toxæmic origin) should the process be allowed to continue after it has once been diagnosed, and that if blindness results therefrom the responsibility is very heavy on any one who fails to advise such a simple proceeding as opening the dura mater. The gravity of this responsibility does not seem to be generally recognized, and it is owing to this as well as to the backward state of neurological diagnosis that melancholy cases of delay occur.

As regards the procedure to be adopted, my own experience is that although in rare instances the neuritis may begin to subside after even the first stage of only opening the skull, it is, as a rule, necessary to make a free opening in the dura mater to effect this purpose. One reservation must be made, that in cases where the tumor directly involves the optic tract, the specially delicate anatomical structure of the optic tract may negative the attaining of this otherwise invariable result.

One more point must be mentioned in connection with optic neuritis. I refer to the localizing value of the incidence of the optic neuritis. I wish to lay down the position drawn from an examination of my own cases of intracranial tumor that the optic neuritis commences on the side of the lesion. I am quite aware that true exceptions may yet be found to this rule, but I would point out that some of the exceptions hitherto described have not been real, that in any given case it is not a question merely of the number of dioptres of swelling of the disc, but it is also a matter of the anatomical changes in the disc, and finally that by the time the patient comes under observation the disc on the side of the lesion may be actually subsiding into decadent conditions at a time when the opposite disc is rising into its maximal swelling.

To sum up, then, during the past twenty years we have learnt that although the old procedure of de Wecker of incising the swollen sheath of the optic nerve in the orbit is of no avail, we can with certainty avert blindness by opening the subdural space early in cases of intracranial disease. Preferably in the basal temporal region of the right side, that is, assuming that no attempt is made to attack the disease itself.

Curative Surgical Procedures.

If the operation is undertaken for the purpose of effecting a cure we have to consider (1) what is the nature of the disease, (2) what loss or aberration of nerve function it causes, (3) whether if the lesion be wholly extirpated there will be a recovery from the disorder of the function, and (4) whether any loss which may have been present before

operation will be made permanent by the necessary extirpation of particular regions of the brain.

On points like the last it is evident that we cannot give a satisfactory opinion until we know precisely first what parts of the central nervous system alone can contain the representation of movements or the record of sensation, and consequently of what parts does destruction entail permanent loss of function.

1. *As regards the cerebrum.*—Apparently from the clinical records we can generalize thus far, that special motor functions cannot be restored if the whole of their cortical representation be removed. The same thing is probably also true of the special senses, and certainly is true of the hemianopic representation of sight. Succinctly stated, this amounts to the generalization that compensation is not possible after the destruction of middle level centres. The higher sensory representations and *a fortiori* the intellectual functions are, on the contrary, not permanently abrogated by the destruction of any one part of the cerebral hemisphere. The net conclusion, however, must be that as little injury as possible should be done, and no more removed than is absolutely necessary. It being always understood that this does not apply to the skull but only to the nerve structures. The opening in the skull must always be free to allow of a proper survey of the brain.

2. *As regards the Cerebellum.*—This question of compensatory power is of notable scientific interest when studied in the cerebrum, which is so clearly an assemblage of different nerve centres (in fact we might almost say organs), but it is no less interesting in the study of a homogeneous structure like the cerebellum, and has assumed a particular importance in the present subject because of Professor Frazier's proposal to extirpate the lateral lobe of the cerebellum in preference to pushing it aside by displacement for the purpose of reaching deep-seated tumors. My own experience is against such extirpations for convenience. In fact, I regard them as an unnecessary mutilation, though quite admitting that in the process of removing a large tumor in the region the cerebellum is considerably bruised when so pushed aside. I ought to add that although I have removed a considerable number of lateral recess cerebellar growths, I have never found it necessary to do more than compress the cerebellum aside.

As to whether there is loss of function from such displacement involving bruising of the cerebellum, I have followed up the longest surviving case that I could find in the Queen Square series, namely, one of cerebellar tumor and cyst combined, which I operated on eleven years ago, when the patient was a boy of 14. He is now a healthy young man of 25. In this case the tumor was a large one, situated

in the right lateral lobe of the cerebellum, which was consequently markedly compressed, and probably the dentate nucleus of that side was also affected. The only indication of loss of physiological function that he now presents is a slight unsteadiness of the hand when he is particularly fatigued, as for instance after a long bicycle ride. As far as the cerebellum is concerned, whether this remarkable recovery is due to restoration of function of the bruised portions or compensation from the uninjured part cannot yet be determined with certainty (I believe the former), but the conclusion I would draw is that we should preserve as much as possible of every portion of the encephalon which is not absolutely shown to be diseased.

Consideration of the Details of Operative Procedure.

(*a*) *Previous Preparation.*—The general preparation of the patient by dieting, enemata, etc., is the same for all operations. In a few instances I have found calcium chloride of probable service in cases where oozing from the bone or superficial tissues was to be expected, as in cases of penetrating endotheliomata of the skull.

The head and cavities in relation to it having been thoroughly disinfected for two or more days with sublimate and carbolic acid, the patient is placed on the table in such a position that, while the head is elevated to diminish the pressure in the venous sinuses, the shoulders are also slightly raised, so that the glottic respiration is not interefered with. If the operation is to be on the cerebellum the patient is placed on his side, with the uppermost arm drawn downwards. This question of posture of the head is no mere matter of convenience to the operator, it is an extremely serious one to the patient for the satisfactory performance of the operation, and is only to be secured by having a suitable head-rest, such as the fork rest of Professor Frazier or the one I use.

(*b*) *Anæsthesia.*—The all-important question of anæsthesia must next be considered. My own experience is confined to general anæsthesia, for I have never yet employed the intraspinal injection of cocaine or stovain.

In 1886 I suggested, in view of the remarkable power that morphine possesses of contracting the cerebral vessels, that it was better to use a combined anæsthesia of morphine with chloroform. I gave up the combined anæsthesia and have employed pure chloroform only for many years.

Of the general anæsthetic substances at our disposal, therefore, there are at the present time two for practical discussion, namely, ether and chloroform

Of these two, numerous experiments on animals in 1883-5 proved to me the striking disadvantages of ether, in spite of its greater safety, which it owes to its far lower physiological toxicity on nerve tissues. Apart from this specific difference the most important contrast between the two substances is due to their respective effects on the blood circulation. Ether directly causes, besides a rise of the blood pressure, a notabe increase of the blood venosity, and therefore much additional and troublesome hæmorrhage. In its later effects—that is, on recovery—it causes excitement as well as in many cases notable headache and, of course, vomiting.

Ether I regard, therefore, as inadmissible as an anæsthetic in operations on the central nervous system.

Chloroform, *per contra*, causes a fall of blood pressure with relatively less blood venosity— although this is by no means absent, as will be seen below. It, therefore, does not aggravate the bleeding, nor embarrass the respiration by causing bronchorrhœa.

By its more essentially paralysing action on nerve centres it causes practically no after-excitement and but moderate headache. It is probably as frequently followed by obstinate sickness, but this depends on many other correlative factors, and primarily on the dose used. Chloroform, however, as already stated, is more dangerous. It kills by paralysis of the respiratory centre as often or more often than by paralysis of the heart.

Moreover, all cases of increased intercranial tension (as is now well recognized) are liable to die at any moment from sudden paralysis of the respiratory centre. How often one sees this accident in cases of intercranial tumour which are only at the very last transferred for surgical treatment!

In the literature of the early days of cerebral surgery may be found instances of death on the operation table. I have no doubt that these were due to failure of the respiratory centre, owing to a dose of chloroform having been given which, though perhaps not necessarily lethal in an ordinary case, was fully so to a patient whose bulb was hampered by previous tumour pressure. Chloroform, therefore, must be used with caution in the surgery of the nervous system, to avoid giving a dose which might bring about fatal arrest of the respiratory centre.

The immediate problem is how to regulate the dosage of chloroform, and let me say, in passing, that the whole of my consideration of this question is applicable to all operations, and not only those on the central nervous system.

At the original suggestion of Dr. Waller I obtained, on July 10th, 1901, from the Council of our Association the appointment of a Research Committee to secure data for the administration of chloroform in known

doses, commencing with its precise quantitative determination. The results so far obtained have already proved of notable value.

The Committee have found that less than 2 per cent. of chloroform vapor in the atmosphere breathed by a patient is enough to produce deep narcosis, and that a much smaller dose is required to maintain unconsciousness to pain. Various apparatuses have been devised to give known percentages of chloroform. Of these I have worked practically entirely with Mr. Vernon Harcourt's.

If the mask of the inhaler be made to fit by wet aseptic towels, the amount of the dose given will be under complete control. With the dose commencing at 0.5 per cent., and rising in one to two minutes to 2 per cent., *the patient ought to be ready for operation after five to eight* minutes. If the initial narcosis be complete no adverse event—for example, vomiting—will occur. If it be incomplete when the operation is commenced various drawbacks will appear. This is, of course, well recognized as a general principle by anæsthetists, but is so salient a point as to deserve repetition.

I venture to repeat what I constantly stated in the chloroform discussions of the last three years, that having now, by means of the Harcourt or other regulator, the power of giving known doses, we ought to arrange the narcosis strictly according to the nerve excitations it is intended to drown, and so avoid contributing to the patient's discomfort by giving unnecessary quantities of the drug.

As a rule the amount of 2 per cent, is given for about five minutes before the incision of the skin and reflection of the flap which constitutes the maximal pain period of the operation. This completed, the dose can be lowered by pushing the tap back and the bone be removed at 1 per cent. As the dura is a sensitive membrane supplied by the fifth cranial nerve the dose should be somewhat raised just previous to its incision to prevent reflex starts or movements on the part of the patient.

As soon as the dura is opened the encephalon can be dealt with without causing any pain except if the course of the fillet or one of the peripheral sensory cranial nerves be accidentally irritated. Consequently all this part of the operation is done under less than 0.5 per cent. of chloroform in the air respired, an amount which of course is far below that required in the induction stage. Indeed in many cases (the edges of the wound being as usual thoroughly protected by gauze) the chloroform can be entirely shut off, the longest period that I have been able to do this for being twenty minutes. This, however, was a case of a cerebellar tumor in a child, and I have never been able in the adult to exceed twelve or fifteen minutes before the return of the reflexes of the limbs necessitated the renewed administration of the drug. After the encephalic lesion is dealt with the percentage always should be raised

to about 0.7 or even 1 per cent. to provide for the insertion of the sutures in the skin, as naturally that is a strong pathic stimulus. Finally this percentage is continued to the commencement of the dressing to prevent the accident of vomiting occurring before the protecting rubber bib can be applied.

(c) *Maintenance of the Body Temperature.*—One of the depressant physiological effects of the general anæsthetic now requires consideration, and that is the remarkable influence which Dr. Horatio Wood and Dr. Hare have done so much to elucidate—namely, a high degree of power to lower the temperature of the body, and therewith emphasize the shock of the operation.

This is of course characteristic of all narcotic substances. Ether, for example, in a very short time will, as Dr. Hare has shown, lower the temperature of the body two degrees Fahrenheit. For this reason I think that all operating rooms should be at a temperature of not less than 75 degrees F., and that the operating table should be provided with a suitable hot water bed.

While, however, cooling due to the anæsthesia can thus be readily combated, my experimental work of the last twenty years on both the carnivora and monkeys has convinced me that to maintain the physiological energy of the central nervous system and prevent shock thereto it is necessary during all operative procedures on the skull and its cavity to prevent cooling by radiation from the brain exposed in the wound. The wound, therefore, should be constantly irrigated, usually with a solution of sublimate of 1 in 10,000 strength, or with saline. These lotions are put into the irrigator at a temperature of 115 degrees for the reason to be detailed directly, and the flow is regulated at will by an assistant.

The use of the hot irrigation fluid, however, is not only to prevent cooling of the nerve centres; it also has another purpose—namely, the arrest of capillary and arterial hæmorrhage.

(d) *Hæmorrhage.*—The first general principle is the recognition of of the fact, originally established by Cohnheim's researches, that as few vessels as possible should be obstructed; and, again, experiments on animals show that in encephalic surgery this principle must be followed as closely in the case of the veins as in the case of arteries. For instance, in the monkey, as well as in man, the blocking of the large temporo-sphenoidal vein and the most anterior external occiptal vein produces softening of the posterior part of the hemisphere. In pursuance of this principle, where it is necessary to remove large portions of the brain, the branches of vessels to be divided should be severed as far as possible from the trunk. A few points in detail must now be discussed according to the nature of the vessel.

From time to time it has been proposed to tie the main arteries—for example, the carotid, with the view of producing a large control of the blood flow from the cerebral arteries. But a thorough consideration of the cases in which this has had to be done by reason of operative necessities has convinced me that it is a measure to be avoided as far as it possibly can be. For instance, when ligature of the carotid has been found necessary in the case where a portion of the hemisphere has been partly displaced and compressed to gain access to a basal tumor, etc., serious and even fatal secondary œdema and softening has proved the adverse influence of this proceeding. On the whole, I cannot suggest anything better than the original plan of tying all the arteries around the lesion before extirpating it; and inasmuch as all arterial supply of the encephalon is necessarily from below upwards, it is better to commence the excision of a lesion by beginning the incision in the brain below, and carrying it upwards and towards the mesial plane.

Although it is necessary that every bleeding artery should be secured by ligature—and on this point one cannot too strongly emphasize the dictum of von Bergmann, that it is very unsafe to trust to tampon pressure—it is remarkably easy to arrest capillary oozing and arteriole oozing from the brain by the simple means of hot irrigation. The most accurate work on this subject to my knowledge is that of the late Dr. Milne Murray, who from his experiments came to the following conclusion, which I prefer to quote in his own words: "It is certain that water from 70 degrees F. to 103 degrees F. will invariably dilate blood vessels and promote the flow from open ones, but it is equally certain that water of temperatures from 110 degrees F. to 120 degrees F. will have just the opposite effect." Theoretically what we require is that the irrigation fluid shall at the moment of contact with the nerve tissues contract the small vessels and at the same time not cause any heat coagulation of the cut surface of the brain. In my opinion, therefore, the temperature of the fluid should not exceed 115 degrees F.—that is, about 46 degrees C.—but it is equally certain that it must not fall below 110 degrees F. or 43.5 degrees C. If a large irrigator be used it is practically an easy thing to keep the fluid at the desired temperature on account of its mass, and it is gratifying, especially in a cerebellar wound, to see the oozing gradually cease during the steady flow from the irrigator "hose" pipe.

Before leaving the question of hæmorrhage from the arterial system I must refer to the use of chloroform in this particular. One of the most striking features of the physiological action of chloroform on the mammalian animal is that it soon (10 to 20 seconds) causes a marked fall in blood pressure. Consequently when a lesion is about to be extirpated, and there is reason to expect considerable oozing, or when the

brain is obviously turgid with congestion, I always ask that the chloroform percentage should be raised for, say, a quarter to half a minute to one or two per cent. This at once induces a convenient, proportionate, and, of course, temporary anæmia.

All bleeding from the veins and sinuses in bone can be immediately and absolutely certainly arrested by plugging with wax if the periosteum round the hole is completely removed. No difficulty, therefore, should ever arise from hæmorrhage from this cause. It is otherwise with wounds of the sinuses and Pacchionian bodies and venous lakes in the dura mater. The bleeding from these, however, no matter how severe, is immediately controlled by pressure with the point of an instrument, while the opening is closed by a fine lateral suture on a round needle in the usual way. The principal veins if necessary are, of course, ligatured like arteries by passing a round needle beneath them, and there only remains, therefore, for consideration the control and arrest of venous oozing.

Venous bleeding, as just stated, commonly occurs in association with capillary oozing, and is often very troublesome in spinal as well as in intracranial operations, especially those at the base of the skull.

This can be rapidly controlled by a simple manœuvre, namely the inhalation of oxygen. Though it is impossible to promptly improve the action of the respiratory centre itself directly or the respiratory movements of the patient and so lower the venous pressure, it is easy to raise the percentage of oxygen in the anæsthetic atmosphere breathed, by directing a stream of the gas through the air inlet of the Harcourt regulator, and so quickly abolish any asphyxia.

It is interesting to see how rapidly the bleeding stops as the color of the oozing blood changes from dark purple to a bright scarlet. I frequently, therefore, during operation, especially towards the end, request the anæsthetist to turn on the oxygen for this purpose as well as for the elimination of shock. It of course must not be forgotten that as the gas is delivered through the Harcourt tap at a pressure somewhat greater than the patient's own respiratory current passing through the chloroform bottle, the in-draught of chloroform air (and therefore the total percentage of chloroform) is somewhat diminished, but this is of no practical consequence, especially at that stage of the operation.

Shock.

I now come to the analysis of the Queen Square cases, and shall endeavor as far as possible to thereby throw light on the actual cause of death occurring within the first twenty-four to forty-eight hours after the operation, that is, from what is termed "shock."

A few prefatory words are necessary as to what is meant by "shock." I quite agree with Crile, who has done so much to elucidate this all-important question, that we should discriminate between shock and collapse; and that while collapse is a temporary accident, in which the patient's nerve centres are capable of being revived by ordinary clinical means, shock, on the other hand, is a post-operative condition, which deepens after the operation for a variable period, and which if it terminates fatally destroys life, as a rule, within twenty-four hours. It is this dangerous phenomenon which we must now discuss.

From observation of the condition of patients after all kinds of operations it is evident that the phenomena of dangerous shock differ according to the part of the body operated upon, according to the condition of the patient before the operation, the concurrence of accidental hæmorrhage, etc. The alteration of the intracranial tension which is produced by opening the skull, of itself necessarily causes shock after encephalic operations in a manner which is somewhat different from that caused by other operations. Therefore I think its treatment must also be different. The nervous system is responsible for the maintenance of the respiration, the maintenance and control of the blood pressure, and for the maintenance and control of the temperature of the body.

In 1893 I pointed out that the early statistics of intracranial operations showed that the majority of deaths occurred from a severe degree of shock which could be in great part avoided by dividing the operation into two stages, the interval between them being about five days. The advantage of systematic two-stage operations only properly applies in my opinion to encephalic cases, although I have used it in emergency in a spinal operation.

The first stage consisted of the opening of the skull, the second of opening the dura mater and removal of the lesion.

Method of Opening the Skull.

As much of the shock depends on the way in which this is effected, I must allude to the principles which I believe govern the opening of the cranio-neural tube at any point. Of these the first is that as far as possible the bone should be divided with as little vertically applied force as possible, and removed with the least possible pressure on the brain and dura beneath. I find that the foregoing principle can be most quickly and readily fulfilled by first removing a trephine disc, then marking with a large saw the area to be removed, and finally cutting away the bone with large bone forceps, all traction being directed outwards.

ALTERATION OF INTRACRANIAL TENSION.

(*a*) *Influence of Region of Skull Opened.*—Having thus briefly dealt with the methods of opening the skull, I pass to the next practical question the influence of the region opened. It is obvious that inasmuch as the nerve centres of organic representation are situated in the posterior fossa of the skull, opening this region might theoretically be expected to cause more shock symptoms than the opening of other parts. No statistics can give a dogmatic explanation of this or any other clinical matter, but on taking all the cases together they give the following result, which is sufficiently demonstrative:—

	Proportionate Ratio.
"Motor area"	1 death in 27 operations.
Parietal and post-parietal regions	1 " 19 "
Frontal region	1 " 13 "
Temporal region	1 " 12 "
Cerebellar region	1 " 10 "

If, therefore, a line be drawn from the frontal eminences to the occipital protuberance, it is obvious that more shock results from operations below that line than from above, and also as we proceed from the frontal to the cerebellar pole of the encephalon.

Duret's conclusion was that pressure applied to the frontal regions specially produced lethal effect by direct transmission to the medulla along an axis parallel to such a line, and I shall show how such mechanical effects can, as far as possible, be avoided during operations on the basal parts of the brain.

(*b*) *Production of von Bergmann's Oœdema Cerebri.*—The surgery of the central nervous system has been enriched by many contributions that have been made to it by von Bergmann, but on no point more particularly than that of the causation and frequency of œdema of the nerve tissues. The readiness with which the cerebrum and cerebellum become œdematous is remarkable, but the circumstances under which it happens are not at all easy to understand, and the facts of a large series of cases do not fall into line with von Bergmann's generalization—namely, that œdema necessarily occurs whenever the skull is freely opened. Thus, after the second stage of an extirpation in which the skull has been very freely opened and a tumor removed, there may be only a very moderate degree of œdema of the hemisphere operated upon, which, like all traumatic œdema of the brain, arrives at its miximum in three to four days, and disappears without any complication. On the other hand, when the skull has been freely opened in the first stage and the dura mater left intact, if the pressure of the growth

is considerable, that may be accentuated by the development of a markedly œdematous condition around the focus of pressure. It is, of course, quite comprehensible that this is owing to the fact that a slight relative increase of tension may unfavorably affect the walls of the cerebral blood vessels, which are still under compression, and bring about a Cohnheim effect. That this does occasionally occur is proved by the very rare phenomenon of transudation of the red blood corpuscles into the œdematous tissue.

This question of œdema is in our experience clearly associated with the further question of unrelieved pressure, and this brings us to the all-important question of success in diagnosis and the much-discussed procedure which is called an exploratory operation. The statistics of Queen Square Hospital throw a good deal of light on this subject, and show that the former condition, namely, unrelieved pressure, is a matter of great practical importance in respect of ordinary palliative operations performed to abolish optic neuritis and relieve the headache, in short to the procedure to which Professor Cushing has recently given the name of "decompression" operations. I will take this point now. Thus, of 13 cases which died of shock after the second stage, in seven by reason of failure of topographical diagnosis, the pressure was not relieved directly over the seat of the lesions, whereas in six cases in which a tumor of the brain was diagnosed and correctly localized, but in which removal was not attempted owing to the size of the growth and other reasons, no patient died.

A comparison of this kind is sufficient, I think, to warrant the statement that the risk of an operation for decompression is greater if the opening for the relief of pressure is not made directly over the lesion. Precisely the same point is borne out with even greater distinctness by the figures showing the relative risk of operating with and without a correct diagnosis. Thus, of 79 cases in which a correct diagnosis was made and the tumor successfully removed, seven cases died of shock—a little over eight per cent.; whereas in 16 cases of tumor which were incorrectly diagnosed and consequently not removed, six cases died from shock—approximately 37 per cent. It is, perhaps, worth while adding that practically in all these latter cases the tumor was a glioma or gliomatous sarcoma—that is to say, a diffuse growth the diagnosis of which is always the most obscure, and at the same time a form of neoplasm in which circulatory changes and œdema is always liable to occur.

Treatment of Shock.

As I have suggested above, the treatment must be arranged according to the symptoms which threaten life, and those may be grouped

according as they affect (1) the respiration, (2) the circulation, (3) the body temperature.

Depression, or aberration of special nerve functions—for example, motion, sensation, etc.—need not be a source of anxiety, as, if the centres of organic life are restored, recovery of the others will certainly follow in proportion to the extent to which their representation has been preserved.

1. *Respiration.*—The embarassment of the respiratory centre in a stage of shock shows itself in increasing degrees of severity as follows: (*a*) shallowness of the respiratory movement, (*b*) periodicity and grouping of the respiratory movements, (*c*) typical Cheyne Stokes respiration. These changes are best dealt with by inhalations of oxygen until the effect of nutrient enemata begins to make itself felt, but it is above all in depression of the respiratory centre that strychnine is of use in combating shock. In speakig thus favorably of strychnine I nevertheless agree with the elaborate and useful work of Dr. Crile on this subject, and believe that in many cases strychnine is used too empirically, too freely, or with undue reliance on its powers, and that in repeated doses it has a depressant action on the circulation. As a stimulant of the bulbo-spinal centres strychnine is, of course, unrivalled, and when any marked alteration in the rhythm of the respiratory centres shows itself, a small dose should be given hypodermically, but for the above-mentioned reason it does not seem advisable to give such a drug beforehand, as is sometimes done either immediately previous to the operation or at the end thereof, with the idea of anticipating difficulties resulting from shock. It is also not to be forgotten that the usual functional depression of the rspiratory and the cardiac centres which immediately precedes chloroform vomiting is particularly marked in these operations, and often causes unnecessary alarm.

2. *Circulation.*—In considering the depression of the circulation by shock, we must again express our indebtedness to Crile for having shown that this part of the subject is not merely a question of the central or cardiac maintenance of the blood pressure, but to a large extent the lack of influence of the vasomotor system. I think the beneficial effects of pressure on the surface of the body can be obtained by bandaging the limbs with cotton-wool. It remains, therefore, to consider what drug treatment is to be resorted to. As regards cardiac stimulation, that has always seemed to me to be a clinical error. The heart does not require accelerating as a rule, but it does require feeding. Undoubtedly repeated enemata (every two hours) of four ounces of beef-tea in which is dissolved Brand's essence of pancreatized milk is the readiest means of beginning this line. If time presses, a very small dose of atropine is useful, and in cases of peripheral vasomotor paralysis

digitalis is also useful, but its use must be at once stopped if there is any acceleration of the pulse. It is, I believe, of universal experience that, compared to the foregoing drugs, alcohol is not worth mentioning, and as it has very depressant after-effects, I think its use is to be avoided. A small quantity of strong coffee gives all the psychic stimulation of alcohol without its depressant effects; and even if it be vomited within a few minutes, benefit results.

3. *Body Temperature.*—In a large majority of cases the body temperature is somewhat lowered, but in certain instances, notably in children, one of the shock effects of operation is the losing of heat control and consequently the temperature, instead of falling, rises from the moment the patient is returned to bed. This rise may in a child become hyperpyretically dangerous, but can, of course, be, as a rule, like all neurotic pyrexia, controlled by cold sponging the upper limbs.

In leaving the question of shock I desire to once more assert that the main principle of operating on the central nervous system should be the avoidance and prevention of all conditions which lead to shock—namely, cooling and mechanical disturbance of the central nervous system. In respect of the necessity of producing less disturbance or chance of pressure upon the brain beneath, Mr. Spencer found in my laboratory that even slight pressure on the surface of the hemisphere materially affects, in accordance with the principles of Duret, the activity and regular function of the respiratory centre. So, too, in the second stage all the necessary instrumental procedures must be effected with as little pressure upon the brain and nerve tissues as possible. Sponging, for instance, should be avoided unless absolutely requisite; and, indeed, the practice of hot irrigation renders it very unnecessary. In particular, during the separation and extraction of an encapsulated tumor—such as a large fibroma, every attempt ought to be made to exert a leverage or traction, so that the direction of the force is always outwards.

On Sepsis.

So far I have said nothing about the second possible cause of death, namely, septic infection. The records of Queen Square Hospital of the past twenty years are somewhat vitiated by accidental infections traceable to causes unconnected with the special region of the wound. Thus of the 17 cases in which death directly resulted from sepsis, one was due to the condition of the scalp before the operation, another to infection from the mouth, and two if not three from imperfect sterilization of the ligatures. Of the remainder, the infection in a very large majority obviously originated during the after-treatment of the case, while the external wound was still open at the drainage spot, especially when

such opening and avenues of infection had been kept open by tampons and plugs. Personally I believe that the present-day precautions are sufficient at the time of operation, especially if the irrigation fluid used be a weak antiseptic lotion, that for the subsequent dressings it is essential to use an antiseptic (I have only complete confidence in a mercury salt), and that so long as the cerebro-spinal fluid continues to escape the most vigorous disinfection of the skin and frequent changing of the dressings must be carried out, for not only so long as the cerebro-spinal fluid is flowing is there great danger of septic invasion, but the difficulty of closing a drainage sinus is increased the longer the cerebro-spinal fluid passes through it.

In summary, I feel inclined to re-assert the view expressed in 1886 that the less drainage is employed the better, and consquently that every effort should be made to close the skin wound as early as possible.

Displacement of the Brain.

With these general considerations before us, there remains the discussion of particular procedures. One of the most important of these is displacement of the brain, which must be resorted to to reach tumors at the base. I mean displacement of the lobes or regions. My first attention to this subject was drawn by being requested in 1889 to operate on a tumor pressing on the front of the optic chiasma, and for this purpose I raised the frontal lobe, but found that the tumor was really a cystic adeno-sarcoma of the pituitary gland, and was inoperable. To facilitate the elevation of the frontal lobe some of the veins entering the longitudinal sinus therefrom were ligatured. On the death of the patient some years later I found that there was considerable softening of part of the frontal lobe in the area drained by these veins, and not directly implicated by the tumor. This and subsequent evidence referred to above led me to the following conclusions, which I have repeatedly made use of and found of service, especially in ten cases of operation on the pituitary body. The cerebral hemisphere is anchored by emissary veins to the dura mater at various points: (1) in the mesial plane, that is, to the longitudinal sinus; (2) laterally, chiefly by the temporo-sphenoidal vein to the lateral sinus opposite the asterion; (3) to a less degree by the external occipital vein, and (4) by the anterior temporo-sphenoidal vein, both of which last are small vessels. but being almost terminal require to be respected. The hemisphere can be readily compressed upwards by inserting a flat spatula cautiously beneath it and between the veins just described. The next question, of course, is: What happens to the hemisphere compressed? This entirely depends on the mode of compression. If the compression is, as it should be, gradual, the

soft nerve tissue soon mould, with very little internal derangement; but it is easy to produce, with too much and too rapid application of pressure, laceration of and ecchymotic oozing betwen the fibres of the corona radiata. Such compression contusions of the basal portions of the hemisphere are relatively unimportant, because they relate to portions of the cortex of which the function is either readily compensated when lost or of very wide representation. The inspection of the deep parts of the skull by displacement of portions of the brain entails trouble to the assistant, because it is certainly disadvantageous to move the retractor when once properly in position. So far I have spoken of the cerebrum. I think that precisely the same principles should prevail in the case of the cerebellum.

With this procedure properly applied to the temporal lobe it is remarkable how much can be seen and correctly examined. With a good illumination the crura cerebri, the circle of Willis, the pituitary body and internal carotid, the second and third nerves come into view. I have in two cases after removal of a pituitary tumor inspected the base of the brain further by means of a small rhinoscopic mirror placed in sella turicca; and it is very easy by continued but gentle pressure with a copper spatula, or with a spatula of suitable size, and with a strong headlight, to inspect the lateral region of the cerebellum and medulla oblongata with the issuing nerves. For these reasons I venture to take exception to the step of removing portions and lobes of the encephalon if these impede the approach to the lesion.

The Ventricles.

Undoubtedly their continued drainage exposes the patient to the particular risk of sepsis, but apart from this there is no reason why they should not be freely dealt with like other parts of the brain, opened and portions of their wall removed as the case may require, provided that one precaution is taken, namely, that blood is prevented from flowing into the ventricular cavity. This, of course, may be obviated at the time of operation by a simple plug, and when the removal of the lesion is completed a temporary tampon is left in for twenty-four hours, by which time all the oozing vessels are thrombosed.

Procedures in the Treatment of Malignant Disease of the Encephalon.

All tumors which, growing from the meninges, penetrate the brain, or which are encapsulated, such as fibromata, myxomata and endotheliomata, tuberculomata and gummata, can all be excised with a good permanent result.

Queen Square Cases. Recurrence Table of 55 Tumors.

	Cases.	
Glioma .....19 Sarcoma 4	23	Recurrence within 2 years, 20.
Endothelioma...	8	1 recurrence 3 years later, died of valvular heart disease. 7 alive well, longest 5 years.
Tuberculous.....	4	2 died within 3 months of tuberculosis meningitis. 2 alive well, longest 7 years.
Gumma..... ..	8	No recurrence.
Fibroma	4	No recurrence.
Cysts.....	5	No recurrence.
Adenoma ..... Adeno-sarcoma..	Pituitary 3	1 recurrence.

But unfortunately a considerable proportion of cases of cerebral tumor are essentially malignant, and by reason of their diffusing through the nerve tissues are very difficult to deal with so as to produce a complete and radical cure. These are the gliomata or glio-sarcomata. One elementary point of difficulty arises from the fact that they not infrequently reach a considerable size before they produce sufficient symptoms to render a topographical diagnosis accurately possible. Further, pathological anatomy does not yet tell us how to classify these growths, or how to determine what is their exact point of origin, consequently it is very difficult to systematically attack their growing focus or plan correctly the complete extirpation of the infected tissues. Further, the regions of the brain surrounding the tumor are commonly œdematous, and this introduces a fresh difficulty—namely, to decide between the infiltration of the brain tissue with neoplastic growth and with simple œdema respectively. The Queen Square series of cases in the foregoing table show that recurrence of malignant disease was observed in no less than 20 out of 23 instances. I have on several occasions attempted, with but partial success, to obtain by extirpating such recurrences the same striking result as Bramann in his classical case, but undoubtedly the treatment of this class of disease will not be surgically satisfactory until the diagnosis is so far improved as to make it possible to remove the growth entirely with certainty in the first instance.

The successful treatment of glioma resolves itself into a question of early diagnosis. In this respect it seems to fall into line with the corresponding malignant tumors, for example, sarcomata of muscle and other soft vascular organs and tissues.

Effect of Directly Exposing but not Removing Gliomata.

In 1890, that is sixteen years ago, my attention was drawn to the remarkable progress of a case of glioma of the cerebrum which was

referred to me by Dr. Buzzard for operation on the understanding that the operation should not be completed if the hemiplegia should be increased or made permanent. The tumor was found at the point diagnosed, but it was so large that obviously its extirpation would have been followed by some permanent paralysis. The wound was, therefore, closed and the patient made a good recovery. Two and a half years later he accidentally infected himself with erysipelas and died in another hospital. At the *post-mortem* examination it was found that the tumor had disappeared, leaving a cicatricial and degeneration cyst. Since then I have operated on ten cases of similar nature, but not always defining the tumor itself. In all, however, classical symptoms were present, namely, double optic neuritis, headache, vomiting, and varying motor and sensory pareses, together with severe intracranial tension and bulging of the brain through the opening of the dura.

I venture to think that we are justified in making the following general deductions on the question of the surgical treatment of malignant disease of the encephalon: (1) That operation should be resorted to as early as possible; (2) the tumor should be, if possible, freely exposed and examined and extirpated with surrounding tissue; (3) that if it cannot be removed without undue interference with important or essential structures there remains some possibility of the tumor undergoing retrogression in a certain number of cases.

Conclusion.

In bringing this discussion of but one set of cases to a close some explanation is, I think, due from me why I did not follow the customary course of accumulating the records of as many cases as possible from the literature and basing my deductions on that basis.

My reason is that the massing together of cases treated by different surgeons under different conditions of operative technique with different clinical histories has always seemed to me an unscientific proceeding.

The errors of clinical observation are so numerous that to arrive at correct conclusions we ought to exclude variations of condition as much as possible.

I have only now the very agreeable duty of rendering an acknowledgment of my sense of indebtedness to Dr. Grainger Stewart, the Pathologist to the National Hospital (Queen Square), who has with indefatigable industry worked out the clinical records of the cases on which this address is based.

MEETING OF THE BRITISH MEDICAL ASSOCIATION IN TORONTO, AUG. 21ST—25TH, 1906.

By JOHN HUNTER, M.B., Toronto.

AT no other time in the history of this continent has there been a more notable gathering of medical men than that of the British Medical Association, whose members, together with visitors from other countries, were the guests of the profession in Canada. It is the purport of this paper to briefly review some of the impressions and facts that bear out the above statement.

General Impressions.

It would be no easy task to rehearse the scientific achievements of even a few of the many distinguished men who honored us by their presence. It would take pages to enumerate the contributions to medical literature of single individuals, whose works alone practically constitute the literature of the subjects to which they are devoted.

But however pleasant and profitable it might be to extol the virtues of these great scientific achievements, yet the indisputable fact still remains that the heart of humanity can never be won by either mental acumen or physical stamina alone. Had our guests come only to offer the sacrifice of scientific knowledge, would the result not have been much like that of the reflected light of the moon—bright and clear enough—but wanting in that warmth that quickens life. It is true our guests brought to our country rare and valuable gifts of medical science that cost great labor to obtain, and which will doubtless be some of the arc lights that for ages to come will illuminate the pathway of scientific medical literature in the early decades of the twentieth century—but they came freighted with an infinitely more precious treasure, viz., love, an attribute of heaven. Clasp of hand, expression of face, and tone of voice left no doubt on any mind of the depth and genuineness of the affection our guests had for their Canadian host, and to this factor more than to any other was due the unqualified success of the recent meeting.

Another feature that will leave a lasting impression on both guests and host, was the emphatic dissipation of some delusions entertained by each. Those of our guests who came fearing that their own, or their colleagues' scalps, might be suddenly lifted off to dangle as a trophy of victory at the belt of an untutored savage, or that their members might be torn asunder by the fierce denizens of the unreclaimed forests surrounding the university, must have been most agreeably surprised to meet nothing more dangerous than an automobile or an electric car. Those who came believing that the climatic conditions, so popularized

by Kipling in his "Our Lady of the Snows," were perennial, had all doubts quickly removed by a temperature that for days kept the mercury registering an almost tropical heat; whilst those of us who expected that the intellectual accomplishments of our guests, as well as their high social status, might form barriers to our approach to them, had our delusion quickly dispelled, for never did guests and host fraternize more heartily, for certainly our guests and visitors were "jolly good fellows—that nobody can deny."

A feature of the recent meeting that must have received a great deal of attention was the selection of chairmen for the different sections, and of those who gave the addresses at the general meetings. In every case the wisdom of the choice was amply verified. The chairmen of sections combined tact, urbanity, and business aptitude; hence the success of every meeting.

The addresses delivered at the general meetings fully maintained the honor of the profession, and the reputation of the speakers, and they will doubtless prove mile-stones in the literature of the subjects discussed.

The characteristics and types of the medical men brought together at this meeting were varied and interesting. Age drew a much wider distinction than either nationality or environment. Youth is the period of progression—age of conservatism. Practically every venture beyond commonly recognized limits was made by young men. Victor Horsley in surgery of the brain, Mayo in that of the stomach, and Jackson in malignant disease of the larynx, are examples. Genius may bid defiance to age and here and there a veteran go on from conquest to conquest, but to the mass of men age brings its restrictions. Forty may not be the dead-line, but within a decade or two beyond the great trend in life is to cling rather to the experience of the past than to venture far afield in new territory. A blind man in any of the sections could easily have recognized from the character of the paper or discussion whether the writer or speaker was young or old.

Next to age, social conditions were probably the most potent factor in the formation of a distinctive type of medical men much in evidence at this gathering. The effects of social refinement and of a very liberal education were apparent in manner and speech, creating a "nobility of intellect."

National traits were well developed. There were present the true Briton, "Holding what he has;" and the typical American, "Get there if you can." In the Canadian physician there is a blending of both of these traits, with the former rather in excess of the latter.

If man cannot live by bread alone, neither can the members of a medical association live on science alone, hence the social functions.

To the gracious personal welcome of the Lieutenant-Governor and his family were added the beautiful grounds and bounteous tables of Government House. Many friendships were formed or renewed on that festive occasion. On Tuesday evening the University quadrangle was converted into a fairy scene, where the President and Mrs. Reeve extended a most cordial welcome to all the members. Tasty viands, enchanting music, and merry peels of laughter wooed the happy guests away into the midnight hour. On Wednesday evening the city, represented by a jovial mayor and generous aldermen, did itself proud by the exquisite taste and bounty of the civic reception. Dr. Bruce's palatial home and beautiful grounds will never again be graced by a larger and more notable gathering assembled to enjoy his hospitality—at least not until he becomes a benedict. Outside of these, the Association was entertained in a princely manner by Mr. and Mrs. Cox, the Yacht Club, and Lambton Golf Club, and by excursions to many "points of interest."

The social functions reached a climax in the annual dinner held in Huron Street Rink. Modern medicine could not have brought together a more distinguished or representative gathering. Men sat at the "table of honor" whose dictum would challenge the attention of the most erudite in any land. A large and enthusiastic audience fully appreciated the worth of the speakers and gave them a hearty welcome and an attentive hearing.

Scientific attainments would be hopelessly handicapped without proper equipment to do effective work, hence the great importance attached to the medical exhibits. A whole floor in the main building of the University was set apart for exhibitors to show their wares. Book shelves were filled with the best, and most recent, literature. Pyramids were built up of bottles and packages of proprietary medicines and food stuffs. The taste and care displayed in the preparation and quality of these exhibits attracted attention and drew forth well merited praise. The surgical instruments, office and hospital furnishings, and electric appliances, were as varied, ingenious and perfect in mechanism as an intelligent and practical age can produce.

A visit to the pathological museum revealed the awful ravages of disease. Almost every organ and tissue in the body, involved in some morbid condition, were on exhibition. The skill displayed in the preparation of many of these specimens was of the highest order. There was material enough for months of study. The photographs of the varied facial and postural expressions incident to many diseases were of great interest.

Work of Sections.

The sections were the great psychic factories, where the mental ore, with flash and spark of intellect, was hammered into concrete

thought and given out to the members as ammunition to be used by them, in humanity's behalf, in the great conflict against disease and suffering.

The attendance at these meetings of the sections, and the interest taken in the papers and discussions, were the crucial tests by which the character and value of the recent meeting can be judged. The rush of members to the sections, the inherent worth of the papers, the intelligent character of the discussions, the urbanity, tact and business aptitude of the officers, the proximity and adaptation of the rooms, the sum total of all these factors places the latest meeting of the B.M.A. in the forefront of its record of meetings. Some of our guests from the mother land said this was the best meeting yet held by the Association.

The characteristic features of the work done in each section can only be obtained by a careful perusal of the papers and discussins—all of which will be published in the official organ of the Association, *The British Medical Journal.*

The medical and surgical sections, as usual, attracted the largest attendance.

In medicine, Sir Thomas Barlow presided. The first subject was "A Symposium on Blood Pressure in Relation to Disease." The various factors influencing this pressure—systolic, diastolic, peripheral resistance, elasticity of arteries, viscosity of blood, etc., were discussed. The value of the educated touch—*tactus eruditis*—as compared with the use of instruments was a mooted question. It was held that the term arterial sclerosis should not be used to signify an entity, but rather to include the product of many conditions and causes. When patients complain of pain where no lesion can be found to account for it, the possibility that it may be due to arterial sclerosis is not to be overlooked. This condition in the abdominal vessels may be a cause of much pain in this region, especially in middle-aged persons. At subsequent meetings of this section, the most important subjects were: "Over-nutrition and Under-nutrition," "Treatment of Typhoid Fever," "Heart Block," "Gastric Neurasthenia," etc.

In the surgical section, presided over by Sir Hector Clare Cameron, the first paper was on "Posture as an Aid in Surgery." Its anatomical, mechanical and physiological factors were discussed as well as the great importance of posture in anæsthesia. The paper on "Enlargement of the Prostate and its Treatment," brought out some diversity of opinion as to which is the better of the two routes—perineal or supra-pubic. Great interest centred in the papers and discussions on "The Treatment of Ascites Secondary to Chronic Hepatitis," "Surgi-

cal Treatment of Ulcers of the Duodenum," and "Treatment of Acute Septic Peritonitis."

Laryngology and Otology were presided over by Dundas Grant. The most spirited discussion centred around the comparatively new operation known as "The Window," or "Submucous Resection of the Septum." This operation may be briefly described as follows: An incision is made through the mucous membrane and perichondrium, either along the crest of the deflection or in front of it. An elevator is passed into this incision and the above named tissues separated from that portion of the septal cartilage and osseous structures involved in the deformity. The primary incision is then carried through he cartilage but not through the perichondrium and mucous membrane of the opposite side. An elevator is now passed through this button-hole opening and the same process carried out on the concave side. The portion of cartilage and osseous structures involved in the deflection are removed. The chief advantage claimed for this operation is that no raw surface is exposed. The results in the hands of competent operators have been very satisfactory. There was a fine display of the instruments used in the different stages of this operation, although there was some sharp criticism about the merits of some of them. The exhibit of skiagraphic pictures, paintings, and anatomical sections of the nasal chambers, and their diseases, was exceptionally good.

In Obstetrics and Gynæcology "The Lantern Demonstrations of the Anatomy of Labor," presented by Barbour, were very highly appreciated.

The sections in Anatomy, Dermatology, Ophthalmology, Pædriatics, Pathology and Bacteriology, Physiology, Psychology, Therapeutics and State Medicine, were all well attended, but for full particulars concerning these section meetings the reader is referred to the *British Medical Journal*, THE CANADA LANCET, and other Canadian journals.

REVERIES.

Nearly all the more important events in human life leave their memories. The recent meeting of the B. M. A. has left its impressions on every one of its members. These will be as varied as are the colors and forms in a kaleidoscope. The reveries of any individual member must of necessity be very limited, as it was impossible to attend all the meetings and get a correct mental perspective of the whole work. The endeavor of the writer is to draw a few conclusions that may be not only of some interest to the reader by way of comparison with his own, but that one or two of them may prove to be straws showing not

only the trend of the current of Canadian medicine in its practice and literature toward the acquisition of national traits, but also proving that the inspiration received from this meeting has greatly increased its velocity in moving towards this much-to-be-desired haven.

The thoughts of all the Canadian members will often revert to the status of medical science presented by our guests from the mother land, and by our cousins from south of the border. As host, of course we Canadians could not, for obvious reasons, occupy much of the time, yet the impression cannot be effaced that we did not measure up to our obligations in scientific work. What evidence have guests or visitors to carry away with them that there are any distinctive traits in Canadian medicine? National characteristics were very pronounced in both British and American medicine. The British trait was a preponderance of wealth in research work, *e.g.*, in physiology, etiology, pathology, etc., and the Americans in an exuberance of daring and skill in the use of their medical knowledge. It may be quite true that in surgical skill and in research work a Horsley and a Mayo are peers, but the impression still remains that the average Briton is rather the more profound in knowledge and the American the more resourceful in his art. In regard to the absence of any distinctive traits in Canadian medicine, perhaps the harshest term that could in fairness be applied to this deficiency is one of regret. Very few of our medical men, now in mid-life or on its distal borders, had the opportunity in youth, either to acquire the literary accomplishments or the special scientific training necessary for the pursuit of research work. The best these have been able to accomplish under the circumstances is that of becoming capable and resourceful general practitioners. But the hour has come in Canadian medicine, as in our national life, when great things can and ought to be done. If our medical students and recent graduates, with the opportunities they now possess and have in store for them, do not give to our practice and literature such characteristics as will give these national recognition, the term disgrace, and not regret, will be used, when in the course of another decade the B. M. A. meets in Winnipeg or Victoria. May we not hope that the achievements of some of our guests and visitors will prove the needed inspiration to waft the bark of many a young Canadian physician into great havens, yet unexplored in the world of medical science, and there unfurl the "Maple Leaf" as a beacon to welcome the dauntless medical mariners of Britain and other countries.

Another revery is, as to the part medical women are to take in future meetings of our Associations. In Dr. Griffith's address on "The Teaching of Obstetrics" much was said of the training of the mid-wife in England. One or more lady physicians were present at each section

meeting and at the American Medical Association in Boston they were a very important factor, both as to numbers and to the part they took in reading papers and in discussions. Will the day soon come when we will have a woman instead of a man occupying the president's chair? It would certainly be quite an innovation to have a lovely woman, with personal charms enhanced by evening dress and sparkling jewels, welcoming the members and discussing learnedly the great medical problems of the day. Feminine graces, and charms of person and dress, add lustre to the functions of home, society, church and state; will her attainments in medical literature and science in addition to these enable her to shine with equal effulgence in the more sombre atmosphere of the medical association? The future may evolve some such change. The veterans of to-day may not live to see it, perhaps would not care to, with their present prejudices against accepting an equality in medicine between men and women.

The third and last of this series pertaineth to the psychological value of social functions. When the B. M. A. was instituted in 1837 provision was made for holding an annual dinner. This important event was generally taken advantage of for the discussion of debatable questions regarding polity or legislation. However, as the years rolled on, one social function after another crept in—soiree, concert, social and civic dinner, reception—until, as now, these occupied an important part of the programme. Doubtless many factors stand in an etiological relation to these innovations, but with only one or two of them is there time and space to deal. Study, experience, research, travel, etc., are potent factors in molding medical thought, and the discovery of efficient means and methods of treatment has been of inestimable value in limiting the spread of infectious diseases, and of alleviating suffering. But all this pertains to physical conditions, and although the benefits conferred by medical science on humanity are far beyond the realm of computation, there is yet much work to be done in a field hitherto altogether too much neglected. In the routine of practice what little attention is paid to those most potent forces, for good or evil—the emotions, feelings and passions! How often our neglect of these leaves our patient the worse for our visit, notwithstanding accuracy of diagnosis and correctness of treatment. Who has not seen disappointment depicted in the face of his patient after a consultation, when the consultant's manner, speech, want of sympathy, or turbulent haste has grated on feelings and emotions already hypersensitive from insomnia or pain! The physical conditions so completely absorb our attention that when we have comprehended these and ministered to them, we act as though our resources were exhausted, and that there was nothing

left but to hasten away. May we not, unconsciously perhaps, only too often leave the impression on our patients that we are "Obscurely wise and coarsely kind!" It is no repetition of an obsolete myth to say that the graces of life and refinement of heart are amongst the most potent influences for good the physician can summons to his aid in the sick room and household. In our scientific zeal how often have we overlooked the portal that opens into the psychologic chambers of our patient's feelings and emotions, and to this oversight may be charged most of that morbid craving for charlatanism that stigmatizes the present day.

We have left the psychological field to be exploited by the blatant delusions of pseudo-scientists, for a notorious example of which we have only to look at the dogmas of a Mary Baker Eddy, the high-priestess of that kaleidoscope of sophistry—the so-called Christian Scientist.

The social function has become a very important factor at our meetings. It can be made a very profitable one if it teach us the value of psychic influences. Who has not noticed the change that comes over the members when they pass from the auditorium to the "reception" on the lawn? The "stress and strain" are replaced by "mirth and jollity." Why not use this transformation as an object lesson? Why should not the physician seek to relieve the "stress and strain" which grip his patient during an examination as effectively by administering the needed balm to the perturbed emotions, feeling, and hopes swaying the soul of the sick one? Why have these great forces to become the prey of the avaricious charalatan? No more profitable lecture could be given to medical students than one on the treatment of the psychological conditions found in the sick chamber and household.

THE APPLICATION OF PHYSICAL CHEMISTRY TO SERUM PATHOLOGY.

By WILFRED H. MANWARING.

Abstract of paper in section of Pathology and Bacteriology, British Medical Association, Aug. 21, 1906.
[*Work aided by the Rockefeller Institute.*]

THE application of physical chemistry to the phenomena of immunity is not only a problem of intense theoretic interest, but one of considerable practical value as well. Since all attempts thus far made to isolate bacterial toxines, antitoxines, and other specific immunity substances, in sufficient purity for chemical analysis, has been unsuccessful, recourse must be had to indirect methods in order to gain a knowledge of the chemical nature of these most important substances. Physical chemistry is the most promising of these indirect methods.

Unfortunately, however, most attempts to apply physico-chemistry laws to serum phenomena, have been based on a necessarily inadequate knowledge of the details and of the complexity of the phenomena in question. Thus the physico-chemical law proposed for the absorption of hemolytic amboceptor by blood corpuscles, is impossible of experimental proof or disproof, due to the fact that the heated hemolytic serum containing the amboceptor, is so greatly altered in its chemical nature by contact with corpuscles, as to render it unanalyzable by present quantitative methods.*

Similarly, the law proposed for the interaction of hemolytic complement and amboceptor, can not be tested experimentally, on account of the impossibility of varying the amount of complement or of amboceptor in a serum experiment without producing marked changes in hemolytic power, due solely to variations in certain non-specific serum components necessarily present.† And the law proposed for the action of diphtheria toxine and antitoxine can not be verified on account of the impossibility of measuring, by animal experimentation, the amount of free toxine present in a toxine-antitoxine mixture, if the proposed physico-chemical law itself holds true.

The above statements are not meant to convey the impression that physical chemistry is not applicable to these and other phenomena. No one believes more firmly than myself in the ultimate application of physico-chemical laws in this field. The statements are intended simply to point out the fact that the phenomena in question are too complex to admit of accurate quantitative determinations by present experimental methods. Such determinations must necessarily precede the application of quantitative laws in any field of biological chemistry.

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* *Manwaring*, Jour. Infect. Dis., 1905, Vol. IV., p. 485-497; Jour. Biolog. Chem., 1896, Vol. I., p. 213-218; Centralb. f. Bakt., 1906, Vol 40, p. 386-388.

† *Manwaring*, "The Third Serum Component" Jour. Infect. Dis., 1906, Vol III., p. 647-662.

PROVINCE OF QUEBEC NEWS.

Conducted by MALCOLM MACKAY, B.A., M.D., Windsor Mills, Quebec.

Once again the frightful mortality among infants in Montreal has been in evidence during the summer months. In spite of the good work of the Pure Milk League the death rate continues to be vastly too great. A larger number of distributing centres is contemplated for next year and the work will be extended as the funds will permit. In connection with the question of infant mortality the Medical Association of the District of Three Rivers has issued a card printed in French entitled "Practical advice to mothers." These cards are distributed among the different parishes, and the "curé" after baptism gives one to each mother, requesting that the instructions therein contained should be followed out carefully. Some criticism has been offered by the medical profession in regard to clause II which contains the modification of milk, but apart from this the card has been received with great favour on all sides. The following is a translation:

I. Maternal milk is the only nourishment which should be given a child until 12 months old; it is only exceptionally that after 8 months prepared foods and light pap may be given. These should in every case be well cooked and prepared with much care.

II. When it is impossible to give mother's milk or when it is inadequate, ordinary milk should be given prepared in a manner to resemble as much as possible mother's milk both in composition and temperature. In order to do this the milk should be slightly sweetened and should contain during the first two months two-thirds of boiled water to one of milk; from two to four months it should be half and half; from four to six months one-third water to two-thirds milk; at eight months pure milk may be given.

III. It is even more important for infants than for adults that they should take their nourishment at regular hours and if necessary the child should be wakened to assume this regularity. Milk should be given at the body temperature every two hours and a half until two months of age, from two to four months, every three hours, and from four to six months, every four hours. During the night it is not necessary to give nourishment so often.

IV. Bottles with long tubes should never be used for children and teats should not be permitted to remain constantly in the mouth, above all those with an opening.

V. If diarrhoea comes on, all nourishment, especially milk, should be stopped until the stools become normal; during this period rice water, barley water and plain water may be given to the little invalid.

VI. Young children, especially when ill, should be bathed every day.

VII. The habit of giving soothing syrups or drinks containing alcohol is to be absolutely condemned.

VIII. From twelve months onward one may give soups with the fat removed, and better, lightly cooked eggs, besides the milk; never give sweets to children.

IX. Teething never causes diarrhoea and very seldom other diseases.

X. It is best, especially during hot weather, to sterilize the milk. To do this put in small bottles a sufficient quantity of milk for one nursing, place as many of these bottles as will be required by the child in 24 hours in a boiler or sterilizer which may be bought from a chemist. Fill up the boiler with cold water until level with the milk and boil for thirty minutes. Remove the bottles of milk and keep them well corked, placing them upon ice if possible.

XI. A cradle is of little use; above all a child which has just nursed should never be rocked.

XII. The garments of a baby should never hinder the movement of the abdomen or limbs, the abdominal band drawn too closely is prejudicial to health.

The seventy-fifth session of the Faculty of Medicine of McGill University opened on September 18th and the regular lectures began on the 19th. It is expected that when full returns are in that this year's freshman class will be larger than last year.

Dr. R. F. Ruttan delivered the inaugural address at the opening of the Medical College. There were at least three hundred undergraduates present. He recalled the foundation of McGill Medical College seventy-five years ago, when Drs. Robertson, Holmes, Stevenson and Caldwell began the systematic teaching of medicine in Montreal. They were also instrumental in establishing the Montreal General Hospital. The first inaugural lecture was delivered on October 7th, 1822, by Dr. John Stevenson, in the Committee room of the Montreal General Hospital. Dr. F. J. Shepherd paid a high tribute to the sterling qualities of the late Dr. Craik, who had been identified with the College for so many years.

It has been noted that in all the Canadian colleges last year's freshman list was small in proportion to the other years, and McGill was no exception to the rule, but this year there appears to be an increase once more. It is interesting to note that the Department of Dentistry is identified with the Medical Department, not only in that the calendars are bound up together, but the dentist is compelled to take the full medical curriculum for two years with the medical students and subsequently take two years in his own specialty. Another feature of interest

in the new calendar is the announcement that the medical course beginning in the autumn of 1907 will be of five years' duration. This step which has been so long discussed has at length taken form, and the natural result of changing the old four-year course of six months to one of nine months has come to the long foreseen five year course.

Medical inspection of schools in Montreal has been spoken of and agitated for several years, and last spring a number of doctors were appointed to carry out the work, but the remuneration was so inadequate that they all resigned their appointments when they found out what work was expected of them.

The Health Committee then called a meeting of representative medical men along with school commissioners and members of the Women's Club, and after hearing varied opinions on the question of the work involved and the salary required, they decided to engage twenty-one physicians at $40 a month to report upon the health of the 30,000 children in the schools at the end of the term. This scheme, if successful, will doubtless open a way for a more thorough inspection later on, when funds will permit of a very material increase in the number of inspectors, and will allow of a more frequent inspection.

Although overshadowed by the British Medical Association meeting at Toronto, yet the third meeting of "L'Association des Medicins de langue francaise e l'Amerique du Nord" at Three Rivers was an unqualified success. Three subjects were brought up for discussion more particularly, namely, tuberculosis, alcoholism, and the hygiene of infants. Upon these subjects many interesting and valuable papers were read.

The majority of French medical societies of Canada and the United States were represented at the congress by delegates, and several societies in France also sent well known men as representatives. The Therapeutic Society of Paris sent Dr. Triboulet on purpose to announce the views of the society in regard to alcoholism. M. Proust represented the medical faculty of Paris and M. Lori, Professor of Hygiene in the Higher School of Colonial Agriculture, represented the French Association for the advancement of sciences.

At the last meeting of the session the following officers were elected for the next congress:—President, Dr. A. Simard; First Vice-President, Dr. Hervieux; Vice-President for W. S., Dr. Lanoix; Vice-President for rural districts, Dr. Sirois; Secretary, Dr. Paquette, and Treasurer, Dr. Dorion.

The next meeting will be held in 1908, and the place will in all probability be Quebec, although this has not been absolutely decided.

CURRENT MEDICAL LITERATURE

MEDICINE.

Under the charge of A. J. MACKENZIE, B.A., M.B., Toronto.

FATALITIES IN ATHLETIC GAMES.

In the *Medical Record,* June 2nd, Dr. Coughlin, of New York, reviews the past season in the United States in order to determine the causes of death among athletes. The whole numbr of cases collected amounted to 128, of which 50 were due to diseases and 78 to accidents of various kinds. Cerebro-spinal meningitis was stated to be the cause of death in nine cases, cardiac disease in eight, pneumonia in seven, pulmonary tuberculosis in seven, Bright's disease in five, appendicitis in four, suicide in two, apoplexy in one, suppurative tonsilitis in one, splenic anæmia in one, senility in one.

In the accidental deaths football was the game mentioned in 28 cases; baseball in twelve; horse racing in nine; boxing in six; gymnasium feats in three; auto driving in two; the other fatalities being equally divided between golf playing, hammer throwing, bicycle coasting, hand-ball, polo playing and wrestling. Of the fifty deaths due to disease, the ages at death were stated in twenty-nine instances, the average age being thirty-one years, the oldest age eighty-seven years, and the youngest eighteen years. In the accidental deaths the ages were stated in thirty-nine cases, the average age at death being twenty-one years, the oldest age sixty years, and the youngest twelve. The average age at death of the whole number was twenty-six years and one month.

The causes of death in football were stated as follows: Abdominal injuries, seven; dislocation of spine with paralysis, three; concussion of brain, five; fracture of skull, five; cerebral hæmorrhage, two; fracture of rib (the same being driven into the heart), two; fracture of spine, one; acute peritonitis, one; convulsions, one; infected wound of knee-joint, one. The causes of death in baseball were stated as follows: Shock (from blow over cardiac area), five; head injuries, four; cardiac failure while running to base, one; blow in abdomen, one; heat exhaustion, one. Fractures of the skull were the causes of death in the nine jockeys. In the swimming accidents, exhaustion by being caught in a current was the cause of death in three cases. Cramp caused one death. The causes of death in the remaining two cases could not be determined. In the boxing accidents blood clot in brain was the autopsy report in two cases. Shock from blow over heart was

the cause of death in one case. In the other three the cause of death was not determined. In the three gymnasium accidents fracture of the cervical vertebræ was the cause of death in all three cases, one of the victims being a young girl of sixteen years. One individual died from cardiac paralysis while playing handball, another sustained a fracture of the skull while bicycle coasting, another died from a fracture of the skull which was caused by the blow of a golf stick, while another died from a fractured skull, the result of a false hammer throw.

The number of cases of death caused by meningitis was due probably to the fact that the disease was epidemic in the country during the period under discussion. The prevalence of cardiac disease is cause for inquiry. Dr. Anderson, of Yale, probably one of the first authorities on the subject in the world, says, that since 1855 there have been 51 deaths of Yale athletes out of 761, with heart disease the cause in two. The weight of opinion among those who have made a study of this question seems to be, however, that athletic exercises are frequently followed by heart lesions.

Pneumonia and tuberculosis rank third, but when one considers that these are the commonest causes of death in New York among all classes one would expect at least this proportion. The large number of deaths due to football, in the comparatively short season, should be proof enough that the American game must go; it gives a larger percentage of deaths according to the number of men engaged than did the Russo-Japanese war. Nicholls and Smith, physicians to the football squad of Harvard University during the past year, required a report of every injury, however trivial, 145 in all. Their opinion is as follows:—

(1) The number, severity and permanence of the injuries which are received in playing football are very much greater than generally is credited or believed. (2) The greater number of the injuries come in the "pile," and not in the open plays, although serious injuries are received in the open. (3) The number of injuries is adherent to the game itself, and is not due especially to close competition, as is shown by the fact that the proportion of injuries received in games and in practice is about the same. (4) A large proportion of the injuries is unavoidable. (5) The proportion of injuries is incomparably greater in football than in any other of the major sports. (6) The game does not develop the best type of men physically, because too great prominence is given to weight without corresponding nervous energy. (7) Constant medical supervision of the game where large numbers of men are engaged is a necessity and not a luxury, although it is a question if a game requiring the constant attendance of two trained surgeons is played under desirable conditions. (8) The percentage of injury is much too great for any mere sport.

Twelve deaths from baseball in the United States, where it is played to such an extent, is not surprising, and they were all purely accidental and unavoidable. Deaths from exhaustion in swimming show the necessity of a sound heart for any one engaging in this form of sport. The six deaths in boxing were all among comparatively inexperienced boxers; there has not been a death among first-class boxers for fifteen years.

On the whole it may be concluded that the athlete is more prone to cardiac disease than another person of the same age, and on this account may be to some slight extent a worse subject for pneumonia and tuberculosis.

The writer makes the statement that the average age at death of athletes is far below that of the average person in the ordinary walks of life; this is only saying that athletes are young persons as a rule. No attempt is made to show that athleticism on the whole shortens life, nor is any account given of the value of it in prolonging life. In Canada the number of accidental deaths due to games is so small as to be a negligible quantity, and our game of football is so different from the American game that it is free from the charge laid. The number of deaths from drowning is lamentable, and it is a question whether knowledge of swimming makes for greater safety or not, as in most cases these accidents happen to those who are in the pursuit of pleasure, not business, and were it not that they are able to swim to at least some distance they might be prevented by timidity from venturing their lives on the water.

STAINING FOR CASTS.

The fact that the refractive index of urinary casts is practically the same as that of the medium in which they are floating is the reason that they are frequently missed in microscopical examination. To obviate this Amann, in the *Journal Suisse de Chimie et de Pharmacie*, suggests the addition to the fluid a small quantity of a pigment as Prussian blue, ordinary liquid India ink will serve the purpose as well.

SURGERY.

Under the charge of H. A. BEATTY, M.D., M.R.C.S., Eng., Surgeon Toronto Western Hospital; Chief Surgeon Ontario Division, Canadian Pacific Railway; and Consulting Surgeon Toronto Orthopedic Hospital.

POST-OPERATIVE ILEUS.

In the *Annals of Surgery*, June, 1906, J. M. T. Finney, Baltimore, reports 26 cases of post-operative ileus. He classifies the cases into early (before the wound has healed), and late; also into mechanical,

septic (peritonitis), and adynamic (disturbances of innervation or circulation). Mechanical ileus is usually characterized by a later onset, the presence of visible peristalsis, colicky pain, asymmetrical distentension, little rise in pulse and temperature. In the septic form the symptoms may be those of peritonitis; when post-operatively the ileus develops without the above symptoms it usually is adynamic. It often is impossible to make an exact diagnosis; in very early cases infection plays the predominant rôle, in later ones adhesions are more often the cause. The author hopes that the opsonic index may prove of service in the differentiation of the various forms, but, at present, the data are insufficient. The indican test is of little value. Many of the symptoms of profound depression are due to autointoxication by poisonous products, especially by neurin. Severe symptoms more often occur early, when the venous circulation of the intestine is obstructed. Partial obstruction is apt to become complete when some indiscretion of diet increases the production of gases. The formation of adhesions is of special interest and yet no reliable knowledge as to the cause of their appearance or disappearance has been obtained. Our ability to control their formation is consequently very limited—filling the peritoneal cavity with sterile saline solution, application of Cargile membrane, of oil, early catharsis, etc., have all been recommended, but are all of little use. In the 26 cases reported, 22 were operated upon a second time for the obstruction. Sixteen cases followed appendicitis, two were after strangulated hernia, two typhoid perforations, two cholelithiasis, one case each after pyloroplasty, tuberculous peritonitis, volvulus and nephrotomy. The causes of obstruction were chiefly, adhesions (7), kinking (7), bands (3). In eighteen, or 78 per cent., the cause of obstruction was due directly or indirectly to peritoneal adhesions. The seat of obstruction was in the small intestine in twenty cases, pylorus or duodenum three, sigmoid two, ascending colon one. Peritonitis was present at the time of the primary operation in fifteen, at the secondary in eight. In most of the cases the treatment consisted of freeing the adhesions or in performing an enterostomy. Ten patients died. Prompt operation should be resorted to after palliative treatment has been given a fair trial. The prognosis is unfavorably influenced by the presence of infection; in its absence it is excellent.

DISLOCATION OF THE OUTER END OF THE CLAVICLE.

In *The Journal of the American Medical Association*, June 7th, 1906, C. L. Scudder states that though this dislocation is in most cases easily treated with a pad and retention apparatus, it is occasionally hard to reduce and causes marked deformity.

Scudder reports two cases and also experiments on the cadaver, which, with other facts, seem to him to support the views of Poirer and Sheldon as to the lesions and treatment. The indications for operation in these cases are irreducibility and failure to maintain reduction. The former is due to the interposition of the torn capsule or the ruptured trapezius, the latter to the rupture of the coracoclavicular ligaments. In dislocation of only moderate degree Scudder would use only a retentive apparatus. When this does not suffice, and in extreme cases, he would suture. Various methods of suturing have been employed: wire, silk and absorbable material, and different forms of pins. The placing of the suture is of some importance, to secure a firmer hold on the outer end of the clavicle a suture to make traction on the clavicle from below in the direction ot the coracoacromial ligament will be most effective. The dorsal position relieves from the weight of the arm and hastens healing. In the cases reported the patients were kept for eight or ten days on the back.

AN IMPROVED TECHNIQUE IN OPERATING FOR THE REMOVAL OF HEMORRHOIDS.

In the *Brooklyn Medical Journal*, June, 1906, L. S. Pilcher advocates the following method:—

"The sphincter is first divulsed. Then the mass to be removed is grasped by a ring forceps and pulled out so as to put the parts at its base well upon the stretch; a longitudinal incision through the mucous membrane and skin on either side of the cone thus drawn out is made, which passes out onto the skin so as to include as much of it as it may be necessary to remove in order to sufficiently retrench the redundant skin tissue.

"Beginning with the apex of this triangular flap of the skin, it is dissected up from the deeper tissues to the base of the pile proper, then into the sulcus produced by this skin elevation and the lateral incisions, an ordinary pair of Kocher's hemostatic forceps is thrust so as to clamp the comparatively narrow pedicle of the tissue left. The portion of the pile that protrudes beyond the clamp is now cut off; then a ligature is applied by needle pasing through a fold of the mucous membrane just beyond the point reached by the clamp. When this is tied, the main part of the blood supply of the parts below is cut off.

"The long end of this ligature thread is then carried by the needle as a running suture around the mass in the grasp of the clamp, from within outward, until all of the tissue grasped by the clamp has been included. The clamp is now loosened and withdrawn, and the ligature drawn up tight.

"By these manœuvres a complete excision of the pile and a definite and satisfactory closure of the wound by suture is accomplished."

RUPTURE OF THE QUADRICEPS EXTENSOR TENDON.

In the *St. Paul Medical Journal,* July, 1906, Homer Gage reports three cases of this rather rare lesion. As it occurs generally in men past fifty years of age, and often after very trifling injuries, such as slipping on the floor or ground, it is usually considered that some degenerative process in the muscle must act as a predisposing cause.

The diagnosis is easily made from the disability and the presence of a deep depression just above the patella.

The results of mechanical treatment are apt to be unsatisfactory, and operatice treatment should always be resorted to if possible.

Of the three cases reported by Gage, two were operated upon, and the results were excellent. In the unoperated case (which was one of double rupture), the Thomas splint was used with a fair end-result.

NOTES ON TREATMENT OF PRURITUS ANI.

The *Medical World* for April, 1906, contains the following practical hints on the very troublesome affection, pruritus ani:—

A saturated solution of boric acid, employed as a wash in pruritus ani, is both a cleansing agent of value, and in many cases a curative power as well.

An ointment prepared by thoroughly blending one ounce of lard and one dram of calomel is a good application in cases of pruritus ani (Hare.)

The internal use of calcium chloride should not be forgotten in cases of pruritus ani. It should be given in doses of twenty grains three times a day, and may be prescribed as follows:—

℞ Calcium chloride, 2 drams.
Tincture orange flowers, 6 drams.
Chloroform water, enough to make 6 ounces.

Mix, and direct one or two tablespoonfuls, three times a day.

Smaller doses may have to be ordered if the stomach proves irritable. These doses often cause an increased thirst. It is best given one hour after meals.

Cocain, incorporated in ointments, often fails utterly in pruritus ani, as the fats prevent its exerting its power.

Sodium thiosulphate, one-half dram to the ounce of water, is of service in certain cases of pruritus ani.

Ringer commends the use of the following ointment in cases of pruritus ani:—

℞ Acid salicyl, 2 drams.
Ol. theobrom, 5 drams.
Cetaceæ, 3 drams.
Ol. myristica, 1½ drams.

—*The Physician and Surgeon*, Aug.

GYNÆCOLOGY.

Under the charge of S. M. HAY, M.D., C.M., Gynæcologist Toronto Western Hospital, and Consulting Surgeon Toronto Orthopedic Hospital.

DYSMENORRHŒA AT PUBERTY AND UTERINE TUMORS.

Dr. Frank DeWitt Reese, of Cortland, N.Y., says, in *The Medical Record*, of Dec. 23rd, 1905, that for 20 years he has been watching the relationship between dysmenorrhœa at puberty and uterine tumors and has been impressed with the fact that nearly all women with uterine fibroids give a clear, unmistakable history of having suffered pain at the very first menstrual period, and of continuing to suffer until the tumor was developed, unless interrupted by pregnancy or relieved temporarily by some medical agent. He mentions the fact that no authority has yet been able to discover the cause, or causes, of uterine tumors.

The writer asks two questions: (1) Is dysmenorrhœa a symptom denoting the presence of uterine fibroids at puberty? (2) Are the causes of dysmenorrhœa exciting causes of fibroids tumors of the uterus? These two questions he answers in the affirmative. Howard Kelly is quoted as saying: "Although all myomata probably exist in fetal life in diminutive form, they rarely give evidence of their presence until menstruation has been established for some years." Kelly also says that the earliest sign of uterine fibroids is painful menstruation. Dr. Reese believes it impossible for a patient to have a tumor of the uterus before puberty, and not have the fact announced by pain with the first menstrual period.

The second proposition, he says, is of great importance, but perhaps may be more difficult to establish. Dysmenorrhœa has various causes; for example, pinhole os, retention, neurosis, but this is dependent on some irritation, displacements, etc. These causes of dysmenorrhœa are capable and possible causes of uterine fibroids. It is said that one-fifth of all women over thirty-five years of age have fibroids, and that about one-fifth have dysmenorrhœa at puberty. Every cause assigned to dysmenorrhœa is either an irritant or a stimulus to tissue

growth. There must be in every cell a substance that has the power to reproduce itself. Irritation brought to bear upon this substance may destroy the harmony between the cells by producing a new cell or by causing the death of a cell. The one thing a cell inherits above every other characteristic to life. Life responds to stimuli.

The cells of the gravid uterus increase and multiply uniformly from the stimulus or irritation of pregnancy. This is a normal condition. A group of cells of the uterus may increase by irritation, forming a tumor; this is an abnormal condition. The one irritation is removed in obedience to nature's laws; the other should be removed by the skilled gynecologist. The equilibrium of the cell-producing power of the uterus should be maintained free from any and all abnormal stimulating influences.

In substantiation of his theory, Dr. Reese gives very fully the history of one of his cases, a synopsis of which I now give to you in his own words:—

"In analyzing the brief history of this case we must be impressed with the four stages of progress in the evolution of the tumor: (1) Dysmenorrhœa at puberty, which was the chief symptom, denoting that there was something wrong. (2) A deformity of the uterus (extreme anteflexion) was discovered at the first local examination, when she was 30 years old. (3) At 36 years of age there were backache, leucorrhœa, and an enlarged uterus with a hard, uneven surface. (4) At 38, a tumor of the uterus had developed to such an extent that the patient detected it herself through the abdominal wails."

"Is it not safe to conclude that a cause that produces dysmenorrhœa at puberty may, if not removed, act as an exciting cause of uterine fibroids?"

"It is my opinion that the treatment for uterine fibroids should be prophylactic, and that dysmenorrhœa at puberty is the pathognomonic sign for the commencement of such treatment. The importance of this treatment, which should include the hygienic care of the adolescent girl, is commensurate with the frequency of the trouble."

DEVELOPMENT OF THE TREATMENT OF UTERINE FIBROMYOMATA WITHIN THE LAST TWENTY-FIVE YEARS.

In the *British Medical Journal*, of Aug. 4th, 1906, Dr. F. W. N. Haultain, of Edinburgh, writes an interesting article on the above subject. He quotes Lawson Tait as having said in 1884: "I have now come to speak of hysterectomy, concerning which I may say at once is

an operation which I detest. Its mortality is fearful. My own mortality has been 35 per cent. Every patient, or at least nearly every one, who recovers, does so, as it were, by the skin of her teeth. The amount of worry which is given me by every case, even when successful, is such as to be almost beyond the recompense of any fee, and the disappointment inflicted by every death is indescribable." The writer then compares that statement with the present mortality, which in efficient hands is perhaps less than 5 per cent. Continuing, he says that the removal of the appendages as recommended by Lawson Tait, like electricity, has had its day, and formed a most valuable method of treatment before the more radical operative measures were perfected. It may simply be mentioned as a milestone on the road of surgical advance, as its uncertainty of cure, inapplicability in many cases, and its impossibility of performance in others, renders it rarely worthy of adoption. He believes that removal of the tumor or tumors with or without the uterus now holds the field as practically the only surgical procedure.

Dr. Haultain arrives at the following conclusions:—Instead of (as was done 20 years ago) commending 90 per cent. to a life of semi-invalidism till the climacteric arrived only probably to relieve their sufferings, we are now able to offer a certain prospect of cure to 95 per cent. at least.

Fully half of those having fibroids have no symptoms and should be left alone, for these growths cannot in themselves be considered as a menace to life, or even a barrier to health, happiness or usefulness.

When, however,—as happens in one out of two cases—they cause symptoms from hæmorrhage, pain, or pressure, it seems to me reprehensible not strongly to recommend active treatment.

To condemn woman to a life of inutility and semi-invalidism during the most active years of her existence so that she may possibly spend a comfortable old age surely cannot be considered worthy of our profession when the risk of absolute immediate cure is so slight.

The doctor has no hesitation in saying that, now that our methods of treatment are so perfected as to reduce the risk of radical operation to the vanishing point, we are warranted in taking a strong position against long-continued temporizing, and if a woman's health and happiness are impaired by reason of a uterine fibromyoma, to urge its removal.

OBSTETRICS AND DISEASES OF CHILDREN.

Under the Charge of D. J. EVANS, M.D., C.M., Lecturer on Obstetrics, Medical Faculty, McGill University, Montreal.

THE RETROVERSION PESSARY.

It is but a few years ago that pessaries played a prominent part in gynæcological practice. Indeed, there was hardly an ambitious young practitioner of gynæcology who did not essay to win his spurs by inventing a pessary, and many of the products were ludicrous. Some special form of pessary was used, at least by its inventor, for each variety of uterine displacement, real or fancied. But gradually the consensus grew that the Hodge pessary or some modification of it, especially Albert Smith's, was the only suitable instrument for general use. This was a step in the right direction, though erroneous notions were entertained as to the action of the pessary, notably the preposterous idea that the upper bar of the pessary pressed the body of the uterus forward into place. There were a few practitioners who felt convinced that this view was incorrect, and they did not hesitate to say so, but their protests made no impression upon the makers of textbooks. Pessaries were used indiscriminately and without the employment of even an elementary degree of skill in their adaptation. The general result was in the highest degree unsatisfactory, and soon pessaries were almost entirely discarded. This action was doubtless hastened by the introduction of various operative procedures for the cure of uterine displacements.

But it was a mistake to give up the pessary altogether. Properly employed, it is still a most useful instrument, and really there was never a time when there were not a few who realized the fact. Now there are numerous indications that the usefulness of the pessary is to meet with general recognition, and that the true mechanism of its action has at last been grasped by careful observers. Such indications may be seen in two of the contributed articles which we publish in this issue, Dr. R. S. Hill's and Dr. H. A. Slocum's. Each of these gentlemen understands the mechanical action of the retroversion pessary and explains it clearly. Each, too, sets forth adequately the limitations of the pessary. But the last word has not yet been said. In spite of its essential excellence, the Hodge pessary has its faults. If they were irremediable, we should have to tolerate them, but they are not. The pessary should not be wholly intravaginal; it should take its support externally, though it should not be any one of the wobbly affairs that are to be found on the market.—*N. Y. Med. Jour.*, Sept. 1.

THE TREATMENT OF HYPEREMESIS GRAVIDARUM.

W. S. Stone, New York, *New York State Journal of Medicine*, May, 1906, regards the origin of the trouble as an autotoxic condition. The chief practical difficulty encountered lies in the fact that the profession and the public regard many of the symptoms as purely physiological. Cases with definite brain, stomach, pelvic and other lesions are not included in this paper, and the neurotic symptoms met with are usually the result of the condition, and not an etiological factor. Experimental work, in the literature, shows that there is an increased retention of nitrogen during pregnancy and the emesis is a clinical manifestation of this accumulation. The methods at our disposal to combat such retention are attempts to cut off the supply of the toxin, to stimulate the organs employed in maintaining a normal metabolism, to aid the excretion of the toxin, and to dilute the circulating poisons. Prophylactic measures should begin at puberty for chlorotic women with poorly developed genitals are most prone to the trouble when they become pregnant in later life. Very probably some of the severe menstrual disturbances are also toxic in origin. A complete chemical examination of the urine gives the earliest indication of the serious import of hyperemesis. If urinary changes are present treatment should be instituted at once. Most important in this connection are the following points: (1) Rest in bed, absolute in most instances, or at least for a few days. (2) Exclusion of all visitors, even members of the family in severe cases. (3) A milk or broth diet, or absolute withdrawal of all food by stomach in the severe cases, but a liberal allowance of water. (4) Catharsis at the beginning of the treatment with calomel and salines, the salines sometimes to be repeated. (5) Colonic irrigations or rectal injections with normal salt solution; intravenous infusions in the severest types. (6) Nutrient enemata. (7) Administration of a few doses of opium (hypodermatically or by rectum) well selected as to time. If the symptoms persist, interruption of pregnancy should be resorted to. The author appears to prefer the use of laminaria and to disapprove of rapid dilatation, which is not well born. Ether should be used as an anæsthetic. If part of the placenta is retained the symptoms may continue until the uterus is thoroughly emptied.—*Am. Jour. Surg.*, Aug.

THE DIAGNOSIS AND TREATMENT OF ECTOPIC PREGNANCY.

H. N. Vineberg, New York, *Medical Record*, June 23, 1906, bases his paper on the study of 53 cases observed in the course of the past seven years. The author combats many of the text-book ideas on ectopic pregnancy; for instance, that there is usually a long period of sterility

antedating the ectopic pregnancy; that inflammatory disease of the adnexa is a frequent forerunner of this condition; and that the attendant bleeding is usually darker in color than that of a uterine miscarriage. The three cardinal symptoms of ectopic pregnancy are amenorrhea, irregular uterine bleeding and abdominal pain. The author emphasizes the point that the absence of amenorrhea should not be regarded as excluding the diagnosis of ectopic gestation; this symptom was not present in five cases of this series. In many cases there is a history that the last menstrual period was irregular in amount, duration or continuity of flow. The bleeding in ectopic pregnancy is usually less profuse than in a uterine abortion, and irregular. These symptoms are important differential points. Abdominal pain is almost a universal symptom. It is usually colicky, paroxysmal, and referred to the lower abdomen. In some instances, the pains are described as "labor" of "bearing down" pains. A peculiar fact noted by Vineberg is the rise in temperature, ranging from 100 degrees to 104 degrees, noted in 14 cases. The leucocyte count is of no value diagnostically. Syncope is noted in about 25 per cent. of the cases. On vaginal examination a mass to either side or behind the uterus is felt in the majority of cases.

Differentially, uterine abortion is the condition most frequently to be excluded. The latter is usually not attended by pain. Intraligamentous cysts and acute gonorrhœal infections also sometimes require exclusion. The author operated on all but one case; the latter refused operation. One death occurred from anæsthesia pneumonia. Most of the cases were operated upon by the abdominal route. Vineberg advises removal of all clots and deprecates unnecessary haste in the performance of the operation. He believes that often incomplete hemostasis is the result of a too rapidly performed operation.—*Am. Jour. Surg.*, Aug.

PERTUSSIS.

In the *Kansas City Medical Journal*, July, there is an article on the subject of whooping-cough by Dr. Crawford, of Fowler, Cal. After a review of the etiology, pathology, etc., in which there is nothing novel, the writer comes to the treatment. He mentions the classical forms of treatment, with which he has had no success, and then describes his method. In the beginning of all cases he uses a formaldehyde lamp, and sprays the throat with peroxide of hydrogen, but the main reliance is put on small and frequently repeated doses of hyoscyamine amorphous and codeine sulphate, in a water mixture sweetened with saccharin.

The prescription for a three months' old child would read as follows:—

Hyoscyamine amorphous .....gr. 1-125
Codeine sulph. .....gr. 1-6
Saccharin .....gr. 1-2
Aquæ oz. ɪ:j .....M. Ft. sol.
Sig. One teaspoonful every hour while awake.

The amorphous salt is preferred as more active, and the dosage is increased according to the age of the child and continued or increased till results are obtained. If the tubes are filled with a viscid mucus do not give the codeine but add ematine, the active principle of ipecac. That writer claims that he has used the treatment in upward of 200 cases with good results, relieving the spasm and effecting a cure in sometimes a week to ten days.

LARYNGOLOGY AND RHINOLOGY.

Under the charge of PERRY G. GOLDSMITH, M.D., C.M., Toronto, Fellow of the British Society of Laryngology, Otology and Rhinology.

THE SECTION OF LARYNGOLOGY AT THE BRITISH MEDICAL ASSOCIATION, HELD IN TORONTO 21-25 AUGUST, 1906.

The proceedings of this section were very well attended and in spite of the extra warm weather a very full discussion was given to each paper. The subjects dealt with covers fairly well the range of Laryngology and Otology and every one surely gained a great deal by the comparison of methods and interchange of ideas. Some splendid pathological specimens were shown which were of great interest to the members.

Socially everything was very pleasant. Dr. Wishart's reception and the luncheon given by Dr. McDonagh were very enjoyable. Enough praise cannot be given to the president of the section. To many, Dr. Dundas Grant asknowledged former associations at the Central London Throat and Ear Hospital and to many more their first meeting with him will carry with them the highest opinions, both scientific and social. The entire business of the session was completed in the time alloted which speaks volumes for the methodical way in which the president and his officers carried out their work.

THE INDICATIONS FOR THE SURGICAL REMOVAL OF TONSILS AND THE BEST METHODS FOR DOING SO.

Otto J. Stein in the *Illinois Medical Bulletin* gives the following as indications for the surgical removal of the tonsil:—

(1) Enlargement interfering with deglution and respiration;

(2) Frequent attacks of tonsilitis, resisting all topical or internal treatment;

(3) Attacks of tonsilitis indicating an avenue for repeated attacks of systemic infection as neuritis, arthritis, myalgia, enteritis, etc.;

(4) Frequent attacks of peritonsillar abscess;

(5) Persistent tinnitus aurium due to pressure from the apex of the gland about the pharyngeal end of the eustachian tube;

(6) Chronic suppurative condition, causing an auto-infection from the pus swallowed or absorbed;

(7) Large and deep pockets in the tonsil, lodging cheesy masses of inspissated secretion and food particles which gave rise to a foul breath and chronic dyspepsia and resist all ordinary local treatment, or after temporary improvement with recurrence;

(8) Spasmodic coughs, asthmatic attacks, suffocating spells, embarrassed respiration and deglution, impaired vocal production are all conditions know to result from diseased and hypertrophied tonsils, and, when they resist conservative methods of treatment, the gland should be removed.

RELATIONSHIP BETWEEN THE NOSE AND THE FEMALE GENERATIVE TRACT.

The Medical Review of Reviews quotes Falta (*Monatsschrift fuer Ohrenheilkunde*) as saying that he recalls the well-known observations of Fliess relative to the genital spots in the nose, and reports on certain observations of his own, after rehearsing Fliess' theory. He found the latter's observations to be correct in quite a few gynæcological cases.

He explains this relationship between the nose and the genital organs in the female on anatomico-physiological grounds, and brings interesting data to bear on the question, among which he cites the fact that the nervous trigeminus which supplies the genital spots of the nose is in contact through the ganglion sphenopalatinum with the nervous sympathicus, which again innervates the female genital organs.

From this, Falta draws the conclusion that this relationship should lead to great caution in surgical attacks on the nose in pregnant women, even if the relationship is as yet obscure.

He cited Friess' cases wherein, after surgical procedures on the nose, abortions supervened. The author was induced to undertake this study because of his experience with two patients in whom, after cauterization of the inferior turbinate, symptoms of pain developed in the ovaries of the opposite side of the body, and menstruation was prematurely induced.

The Canada Lancet

VOL. XL. OCTOBER, 1906. No. 2.

EDITORIAL.

THE MEDICAL STUDENT.

There is nothing so common as advice, and nothing else one can get so much of free of charge. Through all the ages one set of persons has been laying down the laws and precepts for the guidance of another set. It would seem that those who deliver inaugular addresses and the editors of medical journals belong to the former, while medical students belong to the latter. Well, on this occasion, we are rather disposed to belong to the student body and listen to what others have said.

A writer on the editorial staff of a leading newspaper said a short time ago, in discussing the honor of the professions, that "They, through generations of honorable service, have gathered to themselves distinctions and privileges which are the inheritance of those who to-day enter their ranks. The standing in society of a lawyer, a physician, or a clergyman is not the achievement of the individual, but the prestige of a vocation. The difference which persists in the mind of generation after generation as regards the comparative dignity of the professions and the trades goes down deeper than matters of culture or fees; it suggests a higher code of honor and a stricter sense of duty. Trust of the most implicit kind touching matters of the sacredest moment is reposed in a lawyer or a doctor or a clergyman because the traditions of the profession to which he belongs reenforce his personal integrity and make such trust warrantable as well as professionally necessary."

It may be truly said that this high code of ethics began with Hippocrates, whose famous oath is, for the medical profession, second only to the Mosaic code for the whole world of morals.

The inference is clear and applicable alike to teachers, writers, practitioners and students—keep aloft the high ideals.

Carlyle, the sage of Chelsea, who had no great love for the professions, yet called the members of the medical profession a sort of priesthood. Though he might refuse to doff his hat to a king, or a duke, or a mitred bishop, yet he would do it to a physician in the discharge of his duty, however humble that might be. There was surely some great reason why Carlyle should so express himself; for the

burden of his teachings was stern criticism and not praise. Let us all value his praise the more because of its rarity.

But among the sweet writers and dear souls of this world must be placed Robert Louis Stevenson. Of the medical profession this is what he has to say: "There are men and classes of men that stand above the common herd; the soldier, the sailor, and the shepherd not infrequently; the artist rarely; rarelier still, the clergyman, the physician almost as a rule. He is the flower—such as it is—of our civilization; and when that stage of man is done with, and only remembered to be marvelled at in history, he will be thought to have shared as little as any in the defects of the period, and most notably exhibited the virtues of the race. Generosity he has, such as is possible to those who practise an art, never to those who drive a trade; discretion, tested by a hundred secrets; tact, tried in a thousand embarrassments, and, what are more important, Heraclean cheerfulness and courage. So it is that he brings air and cheer into the sick room, and often enough, though not so often as he wishes, brings healing."

But if the medical profession holds out the prospects of great honor, large opportunities, and a fair income, it is also surrounded by many cares, responsibilities, and not a few temptations. There is, perhaps, no calling in life where the need for keeping in the middle course is more urgent than in that of the medical profession. The words of Ian Maclaren (Rev. John Watson) are peculiarly appropriate. "Happy is the man who can just go straight on to his goal regardless of what is to left or right of him, heeding little what others do or say, so long as he satisfies his own mind and conscience, and convinced that so acting his object will be obtained. Valuable as this spirit is in every condition of life which necessitates much intercourse with fellow-men, in no profession—I think I may say in no occupation—does it more conduce to a happy life than in medicine."

As students of medicine—and we are all students—we should ever bear in mind the words of James Anthony Froude, who saw all things through the trained eye of the historian—a good combination of the telescope and the microscope by which a remote and a near view of men is obtained. Well, here is what he says: "The knowledge which a man can use is the only real knowledge, the only knowledge which has life and growth in it, converts itself into practical power. The rest hangs like dust about the brain or dries like raindrops off the stones." Pope puts the same idea in another form when he says:—

> "There goes the learned blockhead ignorantly read
> With loads of useless lumber in his head."

But if it be necessary to avoid this form of useless learning, it is equally necessary to acquire the useful. It is here that the words of Goethe have their place: "Choose well; thy choice is brief and yet endless." The choosing is brief but the effects are enduring. But to gain the knowledge diligence is indispensable. Carlyle tells us: "Not to *see* what lies dimly at a distance, but to *do* what lies clearly at hand." Remember the words of Professor Osler: "With the magic word in your heart all things are possible, and without it all study is vanity and vexation. The stupid man it will make bright, the bright man brilliant, and the brilliant student steady. And the master-word is WORK. "

While it is necessary to work and to choose well in that work, it must ever be borne in mind that the social side needs its polishing. On this again hear Professor Osler: "But do not get too deeply absorbed to the exclusion of all outside interests. Success in life depends as much upon the man as upon the physician. Mix with your fellow-students, mingle with their sports and their pleasures. You are to be members of a liberal profession, and the more you see of life outside the narrow circle of your work the better equipped you will be for the struggle."

"The proper study of mankind is man," said Pope. The medical student should ever remember that he is a naturalist; for man and his diseases are the highest work of the science of biology. The physician has to do with his fellow mortals, their ailments and accidents, their mental and physical pains. For every emergency he must hold himself ready; for in the words of Homer in the Iliad—

> "As leaves on trees the race of man is found,
> Now green in youth, now withering on the ground."

The physician needs a clear head and a kind heart; his work is always complex, often difficult, delicate mostly, and calls for the highest qualities of thought and feeling. In the language of Plato, his motto should be: "My business is to remain there in the hour of danger, and fear nothing but disgrace and cowardice." From the cradle to the grave, from the cottage to the palace, from the lonely midnight call to the great hospital ward, from the quiet hamlet to the fierce battle-field, the doctor follows man. Who else has such opportunities to observe, to learn, to perform? None!

In the midst of work, pastimes, pleasures, social life, ever remember the words of Plato—the greatest of Greeks and one of the greatest of men—"That education in virtue from youth upwards, which enables a man to pursue the ideal perfection." Should such be the aims and

ideals of a student, when he passes into practice to him the words of Dr. Bassett will have their full meaning: "Conscious of this virtue, he feels no necessity for trumpeting his professional acquirements abroad, but with becoming modesty and true dignity, which constitutes genuine professional pride, he leaves this to the good sense of his fellow citizens to discover."

A word from Marcus Aurelius would be in order here. "Take care always to remember that you are a man; and let every action be done with perfect and unaffected gravity, humanity, freedom, and justice. And be sure you entertain no fancies which may give a check to these qualities. Continue to dishonor yourself, my soul! Neither will you have much time left to do yourself honor."

True to this great command of the Roman emperor, Professor Goldwin Smith once said that "the medical profession had ever worn the white wings of peace. There were no wars nor persecutions standing to its charge. Its mission had been, throughout history, the relief of suffering and the betterment of mankind. In its hands were to be found, not the sword, but the olive branch and leaves of healing."

Among the students of to-day there may be a future Sydenham, Boerhaave, Harvey, Hunter, Lister, Jenner. Remember Carlyle's saying: "The Great Man was always as lightning out of Heaven; the rest of men waited for him like fuel, and then they too would flame." And Goethe once more: "Here is all fulness, ye brave to reward you; work and despair not."

DR. REEVE'S PRESIDENTIAL ADDRESS.

In another page we publish a full abstract of Dr. Reeve's Address before the British Medical Association. Though it was not known what lines his address would take, all knew that it would be worthy the occasion.

A careful perusal of the address shows that some important points are emphasized. One of these is the world-wideness of medicine. The medical profession is united in fighting the Common foe to the human race—diseae in every form. Another subject touched upon is the immense value of preventive medicine. But that progress be made in this there must be research. It is here that governments and the wealthy can be of such assistance. The money so spent yields a thousand fold return.

An important feature of the address is the appeal for a simple life. Moderation in diet and temperate habits are the foundations for the best

form of physical and mental work. The late George S. Keith, of Edinburgh, many years ago urged this position strenuously in his little book, "A Plea for a Simpler Life."

Throughout the address Dr. Reeve made many appropriate references to great men and their discoveries. We cannot too often recall the heroes of medicine.

Dr. Henry Barnes, of Carlisle, as senior vice-president, moved a vote of thanks for the scholarly and interesting lecture. He said it was a distinction to move such a resolution, and he accepted it with some misgiving, but he was delighted at the opportunity of expressing his feelings in regard to the material progress made by the City of Toronto. He was greatly pleased at the evident industry and steadiness of the Canadian people, who all had apparently something to do, and no penchant for indulging in intoxicating liquors to excess. The medical association was working for the unity and consolidation of the Empire, for which Canada had made so great a sacrifice. When he was in Toronto last there had been two medical schools. Now the rivalries had been removed, there was but one, and much of this satisfactory condition he believed was due to their worthy dean. A more able, scholarly, and interesting address he had never listened to, and he was glad to express the opinion that Toronto had selected for the presidency one whose reputation was justly great on both sides of the water.

Dr. Roddick, of Montreal, in seconding the motion, said the meeting was far better than the one in Montreal nine years ago. He thought the visit of the association to Canada was one of the best emigration schemes that could be devised, and believed it would be a good thing for the Government to arrange it every five or six years. The King was their patron, and he had his physicians, Drs. Barlow and Broadbent, here to spy out the land, perhaps. When they went back and told him exactly what they saw the King himself might decide to come out next year. They could tell him that the villages of 1860 were now thriving cities, and that the country possessed the most loyal citizens it would be possible to have.

We concur with the words of Dr. Barnes. They are none too flattering. The address of this year will go on record with the many that have preceded it, as worthy of a place with them.

SIR JAMES BARR'S ADDRESS ON MEDICINE.

The address on medicine was both lengthy and scholarly, and was a complete review of our knowledge of the relationship of the peripheral vascular system to the whole vascular system. The main object of the paper was to prove that most cases of heart failure arise not in the

heart itself, but in the smaller vessels, the arterioles and capillaries; which, offering too great a resistance to the onward flow of the blood, end by causing heart-defeat.

This is not a new view of the subject. During the past ten years, much excellent work has been done upon the subject of arterio-sclerosis and its influence in causing heart disease and heart failure. Professor Barr makes good his position by a series of well arranged arguments. From the point of view taken in the address, nothing further could be required.

He spoke of the capillaries as a vast filter bed which pervades every tissue and organ. He drew attention to the fact that sometimes these capillaries in a certain part of the body are very full and at other times nearly or almost entirely empty. In one person a pin could not be inserted without wounding many and drawing blood, whereas in a neurotic person the prick of a pin might draw no blood. Apply a sinapism to a portion of the skin and notice the dilatation and filling of the arteries.

A point to which attention is frequently called throughout the address is the relationship and the difference between potential and kinetic energy. The force of the heart is expended in sending blood into the arteries. Some of this force is manifested in the onward movement of the blood, while some of it is stored in the arteries as potential energy to be again manifested as kinetic energy in the capillaries. If there be mush resistance in the arterioles to the flow of the blood, much of the heart's action will be expended in lateral pressure on the arteries, or in potential energy. At a later moment this potential energy is shown as kinetic energy, or in the movement of the blood in the capillaries. Thus it may be that the heart's action may be strong but the arterial flow slow, and followed by a rapid capillary blood-flow. The higher the potential energy in the arteries, or the slower the flow in them, the higher will be the kinetic energy in the capillaries.

Much attention is paid to the effects of gravity on the blood pressure in various parts and organs of the body. In this connection the vasomotor nerve system plays a most important part. Were it not for its power to control the size of the vessels we could not assume the erect position, and the potential energy in the arteries would fall so low that the kinetic in the capillaries would become so reduced that the blood would contain such a quantity of CO_2 as to convert us into cold-blooded animals.

The two opposing views as to whether the first line of resistance in the vascular system is in the arterioles or the capillaries are discussed. Professor Barr takes strong grounds in favor of the opinion that it is to be found in the small arteries. We mention that this view

is opposed by Sir W. H. Broadbent, who holds that it is to be found in the capillaries, and not in the arterioles. It may be mentioned that the majority of the highest authorities would range themselves on the side of Sir James Barr. In cases of vasomotor paralysis, no doubt the capillaries offer the first resistance to the onward flow of the blood. In ordinary conditions, however, it will be found to lie with the arterioles and small arteries.

Throughout the address there are many references to the viscosity of the blood. Normally the blood is about five times that of distilled water. In some diseases it may be as high as ten times that of distilled water. This gives rise to much resistance to the onward flow of blood in the capillaries, and, of course, must materially lessen the flow through them. This will again increase the quantity of CO_2 in the blood, which has the effect of enlarging the red corpuscles and still further increasing the capillary resistance. This view of the circulation has not received sufficient attention at the hands of the medical profession in the past, and no doubt the address of Sir James Barr will stimulate study along this line—a much needed one.

Another feature of the address, and a most valuable one, is to advance potent arguments against the views of Heidenhain that transudation through the capillaries walls in an excretory process and not one due to pressure. He quotes the investigations of Oliver, Starling, and others, to establish the older belief in the doctrine of filtration under pressure. The interchange of gases in solution takes place by the process of diffusion, and osmosis plays a very important part in the transudation and absorption of fluids. The systemic capillaries readily allow albumens to pass through their walls, but those of the lungs and kidneys do not. If a dropsied condition of the tissues is produced rapidly the percentage of water in the exudate will be high and that of albumen low, because it does not pass through the capillaries by filtration as readily as water. The formation of lymph and its composition depend entirely on two factors: (1) the permeability of the vessel wall, and (2) the intracapillary blood pressure.

Another feature of the address to which we would invite attention is the clear exposition given to show that certain portions of the arteriole system are under the control of the nervous system, while other portions are not, or, if they are, it is to a very slight extent. The arterioles and small arteries of the skin, splanchnic area, kidneys, and muscles, are well supplied with vasomotor nerves and are influenced readily by the nervous system; while, on the other hand, those of the liver, brain, the lungs, and the coronary arteries are little or none under vasomotor control. This has a very important bearing on the various pathological processes which take place in these organs.

The reciprocal relationship in the several portions of the vascular system is given due attention. It is pointed out how the skin acts as the counterpart of the splanchnic area; and that lungs are a reservoir for the left side of the heart while the liver is that for the right sile. During very deep and prolonged inspiration the lungs receive an unusual amount of blood. The veins at their proximal ends are emptied back into the heart and on into the lungs, where the blood is held, thus keeping the left side of the heart empty so that the arteries are imperfectly filled. Under these conditions the pulse may disappear.

The last point in the address to which we would invite attention is that dealing with arterio-sclerosis. This pathological condition is only now beginning to claim its due share of attention. If there be arteriole resistance the lateral pressure on the large arteries is increased. This leads to increased heart action and hypertrophy. If the work to be done by the heart becomes too great, there may be heart failure and fall in blood pressure. In arterio-sclerosis the middle coat is chiefly thickened in the muscular arteries and arterioles, such as the splanchnic area, the skin, and muscles; while in those that are less muscular, such as those of the brain, and the coronaries, the intima mainly suffers. In the induction of arterio-sclerosis an indolent life of luxury is more potent than that of a navvy. When the arterial system becomes sclerosed it loses its elasticity and quality to store potential energy to maintain the circulation during diastole. In such a condition the hypertrophied heart labors to propel the blood, but its work is ineffective because of the loss of arterial elasticity, and there is a marked disparity between systolic and diastolic pressure. When failure begins to set in, the force of the big powerful heart which shakes the whole chest is poorly represented at the periphery. The result is soon a defeated heart.

SIR VICTOR HORSELEY'S ADDRESS ON SURGERY.

Sir Victor Horseley has long been known as an authority on surgery of the central nervous system. It was fully expected he would say something worthy the hearing, and he did. For twenty years he has been studying his subject, performing operations, and watching the results. He had, therefore, something to tell his hearers.

It is no disparagement to his address to state that it contained nothing positively new. Indeed, in the present case, that is about the highest praise we could give his address. It was a case of "Prove all things and hold fast that which is good." If there were no startling new statements in the address, there were, on the other hand, none that could be called in question, or that experience is likely to discard. He sewed, tilled, and now is scattering abroad the fruits of his labors.

The first part of the address deals with the general history of brain surgery during the past twenty years. It is by a comparison of what is being done to-day with what was possible then that the great strides made by this special branch of surgery becomes apparent.

The operative treatment of brain diseases is divided into palliative and curative. In cases where no attempt can be made at the removal of the tumor, much improvement may follow, and sometimes actual cures, by opening the skull and dura mater so as to relieve the pressure. As correct diagnosis is a matter of the utmost importance in order that the operation may be performed over the sight of the growth, he contends that the study of optic neuritis is of much value. It is laid down as a rule that it begins on the side of the pressure.

With regard to the curative operative treatment the address discusses a number of points, which Sir Victor Horseley has found to be of the utmost importance.

The general preparation is much the same as for all operations. The head and the cavities in relation to it are thoroughly disinfected with sublimate and carbolic acid for two or three days. The table should be a suitable one with a proper head rest.

General anæsthesia is advised and the anæsthetic recommended is chloroform. It is contended that with chloroform there is less hæmorrhage and after shock than with ether. The rules laid down for its administration are useful, namely, full anæsthesia when the skin is incised, less when the bone is operated on, more when the dura is opened, almost none when the brain is manipulated, and more again when the skin is sutured.

The body of the patient should be kept warm during the operation, so should the exposed brain, by warm irrigation.

Hæmorrhage should be thoroughly arrested. All vessels should be tied. Capillary bleeding from bone can be stopped by the use of wax, and from the soft parts by irrigation with sterile water or saline at 110F. to 115F. When the bleeding is from veins or sinuses, a ligature should be thrown around them. Capillary venous oozing may be arrested by allowing the patient oxygen inhalation.

Shock is best avoided by the two stage method of operating. The first stage consists of the incision in the scalp and the removal of the bone. In about five days later the second operation is performed, which consists in the opening of the dura mater and the removal of the tumor.

In operation on the brain a very sudden and serious œdema of the brain around the diseased area may appear. This œdema may prove fatal.

If a line be drawn from the frontal eminence to the occipital protuberance, the largest number of instances of shock will follow operations below this line.

In the treatment of shock the inhalation of oxygen gas and the hypodermic administration of strychnine is advised for the respiratory failure. For the cardiac failure reliance should be placed on nutrient enemata, such as Brand's essence and pancreatized milk. Bandaging the limbs with cotton wool is useful. If the body temperature falls, it should be maintained by external means. If it rises too high, it may be reduced by cold sponging of the upper extremities.

The occurrence of sepsis during the after treatment must be carefully guarded against. The main reliance must be mercury and the avoidance of drainage as far as possible.

With regard to the handling of the brain, this should be done with great care. If it has to be moved or raised, the act should be performed very slowly in order that the brain may adjust itself to the changed shape without laceration or bruising.

Surgery is rich because of the labors of such men as Larry, Hunter, Cooper, Lister, and to these we may add Horseley. For twenty years he has given his best talents to brain surgery, and because of his labors we know much of the physiology of the central nervous system, and are able to cope with many of the pathological conditions to which it is subject.

DR. W. S. A. GRIFFITHS' ADDRESS IN OBSTETRICS.

This address was an earnest appeal for better facilities for the practical teaching of obstetrics. The views expressed in the address might not suit some of the ears upon which it fell, as we know of instances where the students are not permitted to make examinations during the progress of a labor.

What Dr. Griffith said about lecturers on the subject of obstetrics who have had but a limited experience, would apply with equal force to any other practical subject, such as clinics in medicine and surgery.

The address is one for the schoolmen to ponder over, rather than for the general practitioner. If students were to take it up seriously, they might demand certain advantages in some colleges, which are not accorded to them at present. We think Dr. Griffith's address, when it has been fully weighed, will do good.

PROGRESS, EVER PROGRESS.

In Schiller's beautiful poem "Columbus," he uses the expression, "West, Ever West." In medicine, we wish the watchward to be "Progress, ever progress." During the recent meeting of the British medical association, four eminent visitors raised their voices in favor of closer medical union between Britain and the colonies, especially Canada.

The first of these was Dr. G. A. Gibson, of Edinburgh, when addressing the meeting of the Canadian medical association. He urged that steps should be taken that would enable graduates of such universities as Toronto, Queen's, and McGill to practice in Britain and her colonies, and to hold appointments in the Army and Navy. These remarks struck a responsive chord.

The second to speak in favor of medical reciprocity was Professor Donald McAlister. In his opening address, as president of the section on Therapeutics, he said:—

"Before we proceed to the business of the day, allow me a few words on a kindred subject. The co-operation between the Dominion and the United Kingdom, which I have suggested, need not be limited to the preparation of an Imperial Pharmacopœia. Some of us would fain see it extended to the whole field of medical study and practice. You may be aware that by our Medical Act of 1886, a person who holds a recognized Colonial medical diploma granted to him in a British possession, who is of good character, and who is legally entitled to practise in that British possession, is also entitled, without examination in the United Kingdom, to be registered in the *Medical Register*. But before a Colonial diploma can be thus "recognized," the Privy Council must be satisfied that the British possession in question affords to home-registered practitioners such privileges of practising there as to His Majesty may seem just. And by an Act of 1905 it is further provided that for this purpose a Province or State in a larger Federation shall be deemed a distinct possession, and therefore entitled to apply for recognition on its own account. Orders in Council have already been issued, applying the Act to New Zealand, the States of Australia, the Provinces of India, Ceylon and Malta, all of which grant medical diplomas of their own. And as these diplomas have been recognized by the General Medical Council, their holders are at once made capable of registration in the British *Register*, and of acquiring all the rights and privileges which registration confers. A similar enactment exists in relation to foreign countries, and already the Kingdom of Italy and the Empire of Japan have been admitted to corresponding privileges. But, with one exception, the provinces of Canada have not yet applied for admission, and to that extent the medical federation of His Majesty's dominions is incomplete. The exception is Nova Scotia, to which the Medical Act was extended by an Order in Council on May 11th in the present year. The Medical Council learned with great satisfaction of the step thus taken by the Maritime Province, and it looks forward with interest to like applications from the other great Provinces of the Dominion. I am aware that on your Statute Book there stands a Medical Act of 1902, which, were it in operation, would go far to complete the confederation

of the provinces by providing for their common action in medical matters, and by assimilating and extending their professional privileges. And I am also to some extent aware of the internal difficulties that have hitherto prevented the Act from coming into effect. But these internal difficulties need not affect the question of imperial recognition and reciprocity. Under our recent legislation each Province can negotiate for itself with the home authorities, as Nova Scotia has done. It need not wait for the others. His Majesty in Council is the arbiter as to the justice of its claim to be included in the medical federation of the Empire, and to be granted the wider citizenship which that implies.

"As things stand, however willing the powers at home may be, a medical graduate of Ontario or Quebec cannot legally hold a medical appointment in the naval or military service of the King. He cannot be appointed surgeon to a British ship, or to any hospital or other public establishment, body or institution in the United Kingdom. He is ineligible as a medical officer of health; he cannot so much as be a candidate for one of our diplomas in hygiene or State medicine. And lastly, he may not use his degree as a qualification for private practice in the United Kingdom or in any of the British possessions—and they are not few—that are governed by our medical acts. These disabilities must often be irksome, and the more because, so far as Canadians are concerned, they are now self-imposed. The Imperial Parliament at least has opened the way for their removal. The next and only remaining step has to be taken by the provincial authorities."

The third to speak on the medical link between Britain and Canada was Sir Thomas Barlow. In his remarks at the Empire Club luncheon he said:—

"He could, however, speak of some of the Canadian young medical men who had gone to England for instruction. The English were a conservative people, and in the London hospitals they saw volatile persons coming in looking for the latest knowledge in science, but paying no attention to cases under consideration. By and by we found another type, a quiet, reticent young man, who attended regularly to his work and studied carefully, who grasped new ideas and soon showed that he knew much more than he said. Enquiry proved that these men came mostly from McGill and Toronto universities. One of the greatest pleasures the delegates had in the meeting was in greeting the young men, now occupying prominent places in their own line. There were many links between the Mother Country and the Dominion, but there was one which was often forgotten, and that was the medical profession."

The fourth to speak upon the inter-relationship in medicine between Canada and the Mother Country was George Cooper Franklin, F.R.C.S.,

Past President of the British Medical Association. He also spoke at the Empire Club luncheon, and among other things said:—

"I have often thought what a grand opportunity it would be for some of our students if they could come over, say, to Toronto or some other university on this side and pass a year or two. This country affords many advantages, such as the development of water powers, which might cause them to remain here, and I think they would form a bond between the two countries."

THE TORONTO GENERAL HOSPITAL BOARD MEETINGS.

The Toronto General Hospital Board met 6th September, but only routine matters were disposed of.

Dr. Noble, as one of the city representatives, will present a motion at the next meeting, asking that the meetings of the board be open to the press. He contends that as there is so much public money invested in the hospital, the subscribers have a right to publicity in connection with its management.

Dr. Noble also intends to have discussed the present system by which "a family compact of the last thirty years" has controlled the hospital in regard to the performing of operations.

The new Provincial Hospital occupies a unique position. It differs from any of the other hospitals in the fact that so much public money has gone into its foundation. The City of Toronto has given $200,000, the University of Toronto gives $50,000, the Ontario Legislature voted $250,000, and the original endowment to the General Hospital is now worth $650,000, or a grand total of $1,150,000.

The fact that a number of wealthy citizens have given large sums does not justify close meetings any more than would the donation to the City Hall of a fountain by a citizen justify the council in holding its meetings with closed doors.

In the case of the other hospitals in Toronto the case is quite different. They have never received any money from either the city or the government. All they receive from these sources is a small per capita allowance for the maintenance of patients who are unable to pay for themselves; and in return for this these hospitals are under strict government inspection.

The new General Hospital is in quite a different position to these. Notwithstanding some generous donations to it, it is virtually founded out of the public treasury, and should, therefore, be regarded as a public institution. We have always held that the meetings of the University Senate and Governors should be open to the public.

We wish Dr. Noble every success in his efforts to secure the open door to the meetings. We hope he will be able to secure the open door to the profession to attend any patient other than those under the order of the city as charity cases. It has always appeared to us to be wrong that persons who are able to pay should be allowed to go into a public ward, and thus secure free medical and surgical attendance. This is doing by an institution what would not be tolerated in the individual. It is wronging the whole profession, and pauperizing the public. It furnishes the student with cases, but it robs him after he is through college.

This subject of hospital abuse is claiming an ever-increasing attention. It will not down. Like every other abuse it must be ultimately righted.

The *British Medical Journal* of 25th August, speaking editorially of Dr. Griffiths' Address in Obstetrics, remarks: "He would like to see the great hospitals financed by the State. We scarcely believe that any Government would find the money to build, equip and maintain hospitals, and yet leave the hospitals exempt from Government control. We hope it will be long before politicians lay hands on our public hospitals. We know not where a finer illustration could be found of the superiority of private to municipal control than in the intelligent enterprise which has hitherto directed our hospitals. We do not want them to become pawns in the political game. Either at St. Stephens or in the borough council."

The new Provincial Hospital may yet experience the influence of the Government and civic control. As time goes by, the influence of the donors will gradually die out, for there is no heredity in a gift, and the father cannot leave his interest in it to his son. The money now being given by wealthy citizens will practically cease to be represented by any one. The hospital will, therefore, be almost entirely under the management of those appointed by the Government, the University and the City Council.

THE COUNCIL AND DR. CRICHTON.

The following editorial from the *Toronto World,* of 31st August, shows how some of the lay papers regard this case:—

The members of the Ontario Medical Council are not the men we think they are, if they are satisfied to do things by halves. Having deprived Dr. Crichton of the right to practice his profession and thereby earn a livelihood, it is up to them to do what they can to put that gentleman in the way of earning his livelihood in some other way.

Dr. Crichton has broken no law of this country. He is not a criminal. Even the criminal is not deprived of all right to practice his calling, as long as he does it honestly. Surely the members of the council are men enough to concede as much to Dr. Crichton.

Is justice a dead letter with them? Is their sense of what is right and fair and sane and reasonable so dwarfed or distorted that a man is to be hounded and beggared, if need be, to gratify the caprice of professional etiquet? Is a man to be ostracized by his brethren of the healing profession because he informs the public of a remedy which has been found to be useful in certain cases?

Is it medical standard or malice that is the motive? It looks very much to the average man as if it was malice. "Here's a man," we can almost hear the council say, "who has dared to defy our arbitrary ethical standard. So be it. He has committed no crime, but no matter. We will teach him a lesson he will never forget, even if we have to starve him in doing so."

Can it be that the practice of their profession has made the doctors callous alike to the mental as well as the physical sufferings of mankind?

The above is the sort of rubbish which newspaper men are capable of writing about the action of those who wish to keep the profession clean on the one hand, and protect the public on the other. The council does not desire to deprive any one of his means of earning a livelihood. The position is this: A duly qualified medical practitioner, whose name is on the register of the College of Physicians, should not advertise a secret remedy. If he wishes to enter the ranks of the patent or proprietary medicine men, he should step out of the ranks of the regular profession, who do not hold secret a discovery, nor have an interest in a secret remedy. This is the standard of the medical profession the world over; and it is as old as Hippocrates, for it is part of the Hippocrate oath. It is this that has done so much to keep the profession free from the evils of commercialism and the mercenary spirit.

Dr. Crichton is not prevented going on with the sale of his remedy for grip or any other diseases, but he does not do it as a licensed physician. Surely any newspaper editor can see this position, and recognize in it its fairness. The council did no wrong to Dr. Crichton. He sought and obtained the council's qualification to practice medicine, according to the accepted principles, which the council is elected to maintain. He chose, however, to practise in another way, and to advertise a remedy, the composition of which was kept a secret from the profession and the public. If Dr. Crichton is suffering any loss because

of the action of the medical council, he has no one to blame but himself. The Royal College of Physicians of Edinburgh, one of the oldest and most respected medical bodies in the world, lays this down as a rule, that if any of its licentiates, members or fellows hold a secret in any remedy, their names shall be struck off the register. This rule has never been called in question.

Instead of the council having too much power, a very large majority of the practitioners of the Province of Ontario admit that it has too little power in dealing with those who depart from the acceped standards of the medical profession.

TRINITY MEDS DINE.

Of all the many interesting social functions held in this city during the Medical Association week there were none that surpassed in interest and enthusiasm the banquet of the Alumni of Trinity Medical College. Through the activity of Dr. J. B. McMurrich and other old grads of the city, a goodly number of the "Boys" were got together at the St. Charles Cafe to pay their respects to Dr. Geikie, who was our honored Dean for twenty-five years, and had all the responsibility of the conduct of the College for thirty-two years prior to its amalgamation with Toronto University. Around that table were gathered men whose homes were scattered all over this old world, and whose speeches, largely reminiscent, told of old days spent in the acquirement of medical knowledge within the walls of old Trinity. It was an interesting moment when Dr. Luke Teskey arose and, in a neat and eulogistic address, presented to Dr. Geikie, on behalf of those present, a beautiful loving cup. The prolonged applause having subsided. Dr. Geikie replied in a speech full of his old time vigour, in which, after thanking his old students for their token of love and esteem, he traced the history of the College from its inception to the day of amalgamation. The early struggles of the Institution were reviewed, as well as the phenomenal success which attended the efforts of the faculty and students through all its years of activity.

After a period of speech-making and song, those present, after joining hands, sang "Auld Lang Syne."

Some of those present were:—Dr. Adams, West China; Dr. Membray, Innisfail, Alt.; Dr. Crawford, Calgary, Alta.; Dr. Ashton, Quincy, Ill.; Dr. Hicks, Alleghany, N.Y.; Dr. Vanstone, Winnipeg, Man.; Dr. Curts, Patterson, N.J.; and many others.

PERSONAL AND NEWS ITEMS.

Dr. A. W. Thornton, of Chatham, has decided to locate in Toronto. He is disposing of his former residence.

Dr. T. L. Gray and Dr. D. L. Ewin have formed a partnership in St. Thomas.

Dr. B. C. Bell, of Brantford, leaves to take a course of a few months in the eye and ear hospitals of London.

Dr. F. J. Hart, of Barrie, has decided to remove to Winnipeg, where he will enter into practice.

Dr. A. McKinnon, Guelph, has gone for an extended trip out west.

Dr. J. P. Morton, Hamilton, has gone for two months to Berlin for post-graduate work.

Dr. William F. Eastwood, of Claremont, Ont., died on the 17th September. He was in his 46th year.

Dr. W. H. Millen, formerly of Woodslee, near London, was killed in the railway wreck at Azilda. For some time he has been living in the West.

Dr. Charles H. Smith, who has practised at Lawrence Station for ten years, has purchased the practise of Dr. S. E. Charlton, of Hespeler, and left for that town.

Dr. Burrows, who has been laid up at the Ross Memorial Hospital, Lindsay, for the last two weeks with a severe attack of rheumatism, is around again.

Dr. T. Millman, a pupil of Drs. Turquand and McKay, of Woodstock, was appointed to a responsible position in St. Thomas hospital, in London, England. He was the second Canadian to become a member of the staff of the English hospital.

Toronto milk dealers were passed under review recently, and a number of the samples of milk examined were found to be adulterated with water, leaving the total solids and the amount of cream below the average. This practice of diluting milk is coming up for investigation from time to time in many cities.

Dr. Alexander Hugh Ferguson, of Chicago, has been awarded a Commandership in the Order of Christ of Portugal. This is the highest honor the King of Portugal can bestow outside of Royalty. Dr. A. H. Ferguson will receive the congratulations of many friends throughout Canada and the United States.

Lieutenant-Governor Dunsmuir has offered to give $10,000 to a sanitorium for consumptives in British Columbia, provided the committees now working are successful in raising $50,000 for the building and equipment. The announcement was made at a meeting in the interest of the sanitorium, addressed by Rev. Dr. Moore, Prof. Woodhead and Dr. Ewart of St. Joseph's Hospital, London.

Dr. Herman quotes authorities to prove that death is far from being the terrible ordeal it is supposed to be. Dr. William Osler found that out of 500 cases he had observed only 90 complained of pain or even discomfort, the great majority giving absolutely no sign whatever. Says Dr. T. Lauder Brunton, a famous English observer: "It is a merciful provision of nature that almost every individual passes out of this world in a condition of anaesthesia."

An important section of the British Medical Association has discussed the question of water pollution by sewage, and the paper by Dr. H. D. Holton, Secretary of the Vermont State Board of Health, contained many strong statements as to the evils and dangers resulting from the discharge of sewage into rivers, streams, and other bodies of water. The trend of the papers and discussion showed a firm conviction in favor of the filtration of sewage to prevent the pollution of water, and also the filtration of water to insure purity for domestic uses. The contention that sewage is not destroyed but merely diluted by water has an important bearing on all sewage and water problems, and seems to be well sustained by the observations and experiments of Dr. F. A. Starkey, extending over many years, on the St. Lawrence and Ottawa Rivers. If sewage is merely diluted, and the injurious bacteria which it carries still live, there is always a danger attending the emptying of sewers into water from which a city's supply is taken.

ECTHOL.

Dr. W. H. Barnett, of Huffins, Texas, in the *Alkaloidal Clinic* for November, 1904, says:—

I am satisfied that ecthol, a combination of echinacea and thuja, will prevent the sting of bees from hurting him. Let him take dram doses every hour for three hours before he commences to work with them. The reason for the faith that is in me is this: They used to hurt me. Last summer I was taking it for a skin disease, and while under its influence I was stung by a wasp on the face and neck. When stung I started to the house to get something to stop the pain and swelling that I expected to suffer with, but instead of pain and swelling, as heretofore when stung, there was no more of either than a mosquito or gnat would have caused.

BOOK REVIEWS.

THE EAR AND ITS DISEASES.

A Text-book for Students and Physicians. By Seth Scott Bishop, B.S., M.D., LL.D., Honorary President of the Faculty and Professor in the Post-Graduate School and Hospital of Chicago; Surgeon to the Post-Graduate Hospital and to the Illinois Hospital, etc. Illustrated with 27 colored lithographs and 200 additional illustrations. Royal octavo, 440 pages. Bound in extra cloth. Price, $4.00 net. F. A. Davis Company, Publishers, 1914-16 Cherry street, Philadelphia, Pa.

The author of this book is already well known on account of his work on the nose, throat and ear. This present book is an elaboration of the work and teaching in the ear section of the former book. The book takes up fully the anatomy, the physiology, the diagnosis, and the treatment of the ear and its diseases. The book is well up-to-date, and is a reliable guide to this class of diseases. While it is a useful work for the specialist, it is of very particular service to the general practitioner. We recommend this book with confidence.

A PRIMER OF PSYCHOLOGY AND MENTAL DISEASE.

For Use in Training Schools for Attendants and Nurses and in Medical Classes, and as a Ready Reference for the Practitioner. By C. B. Burr, M.D., Medical Director of Oak Grove Hospital (Flint, Mich.) for Mental and Nervous Diseases; Formerly Medical Superintendent of the Eastern Michigan Asylum; Member of the American Medico-Psychological Association; of the American Medical Association; Foreign Associate Member Societie Medico-Psychologique of Paris, etc. Third edition. Thoroughly revised, with illustrations. Pages viii-183, 12mo. Bound in extra vellum cloth, $1.25 net. F. A. Davis Company, Publishers, 1914-16 Cherry street, Philadelphia, Pa.

This little book is divided into four parts: psychology, insanity, medical management of insanity, and nursing the insane. Each of these parts is well written and contains much useful information. The part dealing with insanity goes over the grounds of definition, causes and forms. The forms of insanity are classified under infection psychoses, exhaustive psychoses, intoxication psychoses, insanities from thyroid gland, dementia præcox, paralytic dementia, dementia, mania, senile insanity, epileptic insanity, and hysterical types. The book is well written and will prove a very useful guide to this class of diseases.

A SHORT PRACTICE OF MEDICINE.

By Robert A. Fleming, M.A., M.D., F.R.C.P.E., F.R.S.E., Lecturer on Practice of Medicine, School of the Royal College Edinburgh; Assistant Physician, Royal Infirmary, Edinburgh. London: J. & A. Churchill, 7 Great Marlborough street, 1906. Price 10s, 6d net.

There might seem to be no need for a smallish manual on the practice of medicine. A careful examination of the present work shows that the author has produced an excellent guide for the student. The book is got up in an attractive form. The paper is thin and of superior quality, and the typography is all that could be desired. While the book is of only medium size, it contains about 750 pages, owing to the quality of paper used. Padding is avoided, but facts are not omitted. The best that is known is given. We have found very much pleasure in reading this book, and wish for it a large sale.

A GUIDE TO DIABETIC COOKERY.

By Frederick James, M.P.S. (Great Britain.) All rights reserved. Published by Callard & Company, 74 Regent street, London, England.

Messrs. Callard & Company are food specialists to the great hospitals, and were so to the late Queen. The key to the book is in the statements, "the secret of successful diabetic dieting is contained in the one word 'variety'," and "the main principle is the avoidance of starch and sugar in their many forms." The various diets are given under soups, sauces, meats, puddings, savouries, sweets and sundries. A classified list of foods that may and may not be taken are given. The booklet of 60 pages is just what is wanted and should be in the hands of every doctor. They can be had from W. Lloyd Wood, Toronto.

PROGRESSIVE MEDICINE.

The third volume for this year has just come to hand. It is fully abreast of the other volumes of this series. Messrs. Lea Brothers merit the thanks of the profession for the care they have given to this series of volumes. A more extended notice will appear next month.