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THE
MONTREAL MEDICAL JOURNAL.

VOL. XXXV. OCTOBER, 1906. No. 10.

THE PATHOLOGICAL SECTION OF THE BRITISH MEDICAL ASSOCIATION.

Professor Ramsay Wright's large lecture room was none too large for the Pathological Section which, like the other sections at this meeting enjoyed an attendance far in excess of what is usual — only upon the last morning, whether through carelessness or oversight on the part of those responsible, whereby the programme of the previous day was given in the daily journal, did the attendance become meagre, and some of the most valuable communications made to this section, those upon pathogenic protozoa, were given to an audience altogether incommensurate with their interest. The same may be said with regard to the communications offered. Although an extra session was afforded, the work of the section beginning on the Tuesday and not on the Wednesday, the time afforded was inadequate for the proper presentation and discussion of the papers, and this, even when certain papers offered to the section were given over to other sections for delivery there.

The main features were the three discussions, the first (along with the physiological section) upon the Physiology of the Nucleus, the others upon Malignant Growths and Arterio-sclerosis.

Professor Adami opened the first of these with an address upon the "Dominance of the Nucleus," which we hope shortly to publish, as stated by him. There has been no more important series of biological studies made in Canada than those published in succession during the last fifteen years by Professor A. B. Macallum and his pupils upon the histology and micro-chemistry of the nucleus. That this subject should be brought forward in Toronto was therefore most fitting. The discussion should bring home to medical men the rapidly growing recognition of the controlling part played by the nucleus in the cell economy.

The pity is that so large is the subject that in the few minutes given to those who succeeded the opener, Professor Macallum, Dr. Gustav Mann, Professor Carlier of Birmingham, and Dr. Roaf of Liverpool, could enter into no extended criticism of the opening address.

The discussion upon malignant growths was opened by Dr. Clowes of Buffalo. It is to the Buffalo Laboratory, and more especially to Dr. Clowes that we owe the first studies upon two remarkable outcomes of experimental cancer in mice, namely, the spontaneous disappearance of the cancerous new growth in a small percentage of the animals after having attained a certain size, and the fact that animals showing such disappearances are immune to subsequent implantation of mouse cancer. It may be remarked that Professor Ehrlich has since confirmed and explained these observations. The last annual report of the Imperial Cancer Research Fund in London, published a few weeks ago, most unfortunately announced that Dr. Bashford and his staff had reached like conclusions, without a single reference to the prior work of Gaylord and Clowes and Ehrlich. From that report, it might be concluded that Dr. Bashford had been the first to recognize this acquired immunity against malignant growths. Dr. Clowes in his speech opening the discussion objected most strongly to this tacit assumption of priority, pointing out that Dr. Bashford had called his earlier results in question, suggesting that what he regarded as disappearing tumours were only inflammatory foci, and that, now, without a word of retractation he had confirmed if, indeed, he had not appropriated the earlier work. Dr. Bashford in following upon Dr. Clowes could but apologize for his failure to recognize the earlier works, and thus the incident passed over. He contributed a thoughtful address upon the factors influencing the media of malignant growths, and was followed by Dr. Gaylord with a very remarkable study of an enzoötic of cancer, if it may be so expressed, affecting the mice of a certain dealer in Springfield, Ill., in which the animals which had been housed in a certain cage tended to show malignant growths, even after different stocks were placed in the cage and when the cage was removed to different localities. Another valuable contribution to the discussion was Professor Warthin's demonstration of sections from various conditions of Hodgkin's disease, Leukæmia and Lympho-sarcoma, tending to the conclusion that all are but different grades of a neoplastic process, so that all might be included under the heading of Leucoblastema.

There was a full attendance at the discussion upon Arterio-sclerosis, opened by Professor Welch, who, while accepting Jore's conclusion that the commonest type of arterio-sclerosis is one characterized by a

preliminary overgrowth of the deepest layer of the intima, with splitting of the internal elastic lamina, was not prepared to accept the dictum of that authority that this form is to be regarded as alone arterio-sclerosis. With Dr. Klotz, who followed him, he pointed out that clinical arterio-sclerosis, the form recognized by the hardening of the radials, is of a wholly different type, a type characterized by primary changes in the media. This, the so-called Moenkeberg type, he would also include in his classification. He proceeded to consider in succession the other conditions of arterial change proliferative endarteritis, syphilitic mesaortitis, etc., which have been differentiated within recent years, and showed in a most interesting manner how from gross and histological changes we are learning to distinguish certain well defined forms of sclerosis.

Following upon this consideration of the classification of arterio-sclerotic conditions Dr. Klotz, of Montreal, took up the subject of the experimental products of arterio-sclerosis, basing himself largely upon his own important studies of the past three years. His main conclusions were (1) that the changes produced in the rabbit by treatment with adrenalin, barium chloride and digitalis are in all essentials identical with the Mœnkeberg type of sclerosis seen in the middle sized arteries in man, and he exhibited a series of aortas of rabbits, and femorals and iliac arteries from man showing this correspondence; (2) that while diphtheria toxine causes the same type of disturbance in the rabbit, typhoid and streptococcic toxines and dead cultures of these organisms induce in that animal a primary overgrowth of the intima, a form of endarteritis proliferans. This, so far as we know, is a new fact, and demonstrates the existence of at least two types of sclerotic change in animals of the laboratory; (3) his observations led him to the conclusion that it was not the high pressure alone that caused the sclerotic changes in adrenalin animals, but that there was in addition a toxic action of this drug upon muscle elements.

Dr. Pearce of Albany, who also has studied extensively experimental arterio-sclerosis, while agreeing in the main with Dr. Klotz, was of the opinion that the degenerative changes in the media are not so much due to a direct intoxication, but are secondary to an ischæmia brought about by the action of adrenalin and allied drugs upon the arterioles and vasa vasorum.

Professor Aschoff of Marburg, laid stress upon the histological variations in the aorta, and its visceral and other branches, suggesting that one and the same cause acting upon arteries of different structure induces distinct varieties of lesions, implying thus that certain at least

of the different types of arterio-sclerosis have a like origin. Other contributors to the discussion were Professor Clifford Allbutt and Dr. Adami, the former holding in connection with certain remarks of Professors Welch and Aschoff, that modern pathologists were perhaps inclined to recognize too freely compensatory and adaptive changes, the latter pointing out that pathological processes as distinct from primary injuries to the tissues must be regarded as reactive and characteristically adaptive, and that the remarkable changes in the intima which succeed medial degeneration cannot be regarded as inflammatory, but are exquisite examples of adaptation. He was of the opinion that experiments of a less severe type conducted over a longer period might demonstrate that the Jores' and the Moenkeberg types of sclerosis are reactions to different intensities of the same noxa, and thought that certain observations recorded by Pearce tended to favour this view.

It is not possible to epitomize here the numerous individual papers contributed to this section. These may be noted in series. In what may be termed the antitoxin group, note may be made of the discussion between Pearce and Jackson of Albany on the one hand, and Beebe and Ewing of New York on the other, regarding the production or non-production of specific cytotoxins following upon the injection of nucleoproteids; as also of Ford of Baltimore, (late Fellow in Pathology at McGill), upon the production of an antitoxin for poisonous mushrooms. The poison in question was shown to be a glucoside and the antitoxin produced by Ford is the first successful production of an antitoxin to this class of poisons.

Two papers not wholly consonant were contributed by F. J. Smith of the London Hospital, and Türck of Chicago, upon gastric erosions and peptic ulcers, the former calling attention to the relationship of gastric erosions to inflammatory hyperplasia of the submucous lymph nodes, the latter affording evidence that long continued feeding with or injections of cultures of B. coli of low virulence result in the production of both gastric and duodenal ulcers. While judging from his admirable photographs Türck has succeeded in producing well marked ulcers, his explanation of how the coli bacillus and its toxins set up these ulcers is largely hypothetical.

Turning to tropical disease Professor Hewlett read for himself and Dr. DeKorte an interesting note upon a disease simulating Beri-Beri, occurring in a batch of monkeys, and that in such a way as to suggest strongly an infective origin with acute gastro-intestinal onset. Dr. Hamilton Wright brought forward further cases in man favouring his contention that there is an acute gastro-duodenal onset to this disease,

the more common paretic manifestations being, as he terms them, residual and comparable to a certain extent with post-diphtheritic paralysis.

The papers upon pathogenic protozoa were of considerable importance. Professor Novy of Ann Arbor led off with an excellent lantern demonstration in support of his view that spirochætes are of bacterial nature and not allied to the trypanosomes. Professor M. Nicolle gave the results of his studies of the action of a large series of aniline dyes upon animals infected with some other variety of trypanosome (sleeping sickness, mal de caderas, etc.).

With regard to vaccine and variolous organisms Dr. Hewlett read for Dr. DeKorte a further note upon the amœboid or sporozoon-like organisms which he claims to have cultivated from vaccine lymph. Dr. Ballah of Montreal, in the course of his notes upon vaccine lymph, pointed out that he had seen and at one period believed that he had cultivated for many generations the forms described by DeKorte. Eventually he had found like forms in sterile albuminous fluids and so could only regard them as of the nature of albuminous precipitates. Dr. Ballah drew attention to a remarkable clouding of his media in certain tubes inoculated with vaccine lymph, which clouding manifested itself in successive tubes by passage. He did not venture to make any positive conclusions regarding the clouding save that if of microbic origin, the causative microbes must be at the limit of visibility. Dr. Kinyoun of Philadelphia was a pessimist. He had seen or thought he had seen every type of organism up to spirochætes and trypanosomes in vaccine lymph. Dr. Ballah described a simple method (depilation by sodium sulphide without scarification) whereby typical vaccine vesicles could be caused to develop in rabbits and guinea pigs. The method promises to be of considerable importance in testing the strength and efficacy of vaccine lymphs.

Dr. Beattie of Edinburgh gave a demonstration of a sporozoon-like site he had studied, found associated with polypoid growths in the nose in India (*Rhinosporidium Kincalyi*).

Three other communications deserve note:—Dr. Beattie's most luminous and convincing summing up in favour of regarding the diplostreptococcus found in cases of acute rheumatism as a specific organism distinct from the ordinary streptococcus pyogenes; Dr. Armand Ruffer's description of the diverse and contradictory results obtained by those under him at Alexandria, Egypt, in employing Pfeiffer's reaction, agglutination tests and other most modern methods in determining whether spirilla gained from stools of choleraic and dysentery patients

and from the water-tanks of ships were or were not to be regarded as true cholera spirilla. Among other striking results obtained by him it may be mentioned that the majority of the cultures sent to him from India as having been gained from the dejecta of cholera patients, failed to correspond with what the Berlin authorities have laid down as the true Spirillum Choleræ Asiaticæ. Lastly, Dr. O. K. Kaufmann of Birmingham, England, described what would seem to be a valuable method of estimating iodides in urine, showing that the rate and extent of excretion of iodides given by the mouth affords a method of determining renal efficiency which is superior to those at present in use.

EMPYEMA AND MAXILLARY SINUSITIS.—DIAGNOSIS AND TREATMENT.

BY

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Translated by DR. FRANK HARWOOD, Dentist,
Assistant Professor in the Dental School of Laval University.

During the last ten years nasal surgery has made great progress, especially since the remarkable work of Luc of Paris. This author has made a special study of the sinuses of the face, and has greatly contributed toward our advancement in rhinology, by giving us brilliant operative methods. This communication will be a *résumé* of the therapeutic knowledge we have on the chronic diseases of the maxillary sinus, a subject which "La Société d'Odontologie canadienne française" has done me the honour of discussing before it.

Formerly, all suppurations of the antrum of Highmore were invariably treated by means of a canula penetrating into it after extraction of a molar tooth and perforation of the alveolus. Cooper, in the 18th century, first had the idea of this minor operation, and advised washing the sinus with divers antiseptics which were very often employed indefinitely. To-day, with the knowledge we have of the pathogeny of this disease, we are in a better position to fight with success against its ravages, especially since we have learnt to diagnose the difference between empyema of the maxillary sinus and true sinusitis. To explain more clearly the difference between these two diseases,

I must say a few words on their etiology. The diagrams which accompany this article, I trust, will make this subject clearer.

A.—True Maxillary Sinusitis.

When a patient comes to you with suppuration of the antrum of Highmore, the first thing is to find out the seat of the trouble. The recent works of Lermoyez and Mahu, so clear and precise, have largely contributed to the broadening of our knowledge on this subject. In truth, these authors teach us that in maxillary sinusitis, the walls of the sinus are affected, and, in consequence, pus is secreted by the cavity itself. The mucous membrane degenerates into a layer of fungous and myxomatous tissue of a thickness often reaching one centimetre or more. In other words, true sinusitis is a secretion of pus "in situ" (Fig. 1).

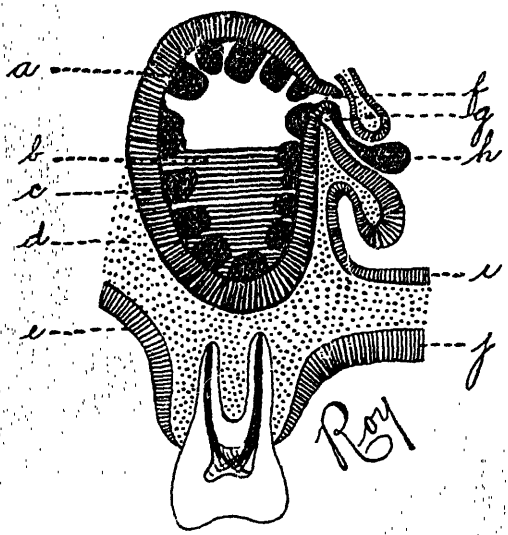

Fig. I.—Maxillary Sinusitis.

a. Buds of the sinusal mucous membrane. *b.* Pus in the sinus. *c.* Hypertrophied mucous membrane of the sinus. *d.* Bony wall. *e.* Gingival mucous membrane. *f.* Ostium of the sinus. *g.* Middle meatus. *h.* Mucous polyp of the nose. *i.* Nasal mucous membrane. *j.* Palatine mucous membrane.

This disease has for origin an acute sinusitis caused by rhinitis due to influenza; or, again, the transformation of maxillary empyema into chronic sinusitis, by alteration of the mucous membrane and formation of granular tissue.

B.—Maxillary Empyema.

In maxillary empyema, pus is collected in the cavity without alteration of the walls. This pus may have for origin a dental abscess;

or, again, come from the nose by the ostium, following a frontal, sphenoidal or ethmoidal sinusitis. In these cases, the mucous membrane is normal, and the sinus acts as a reservoir for pus of extraneous origin. It can remain in contact with the mucous membrane of the sinus for a long period without altering it. However, with time, the mucous membrane may become infected and suppurate. Fortunately, this transformation takes a long time to occur, contrary to what takes place in cases of acute sinusitis of nasal organs, where pus in a state of stagnation quickly attacks a mucous membrane which, because of its altered state is in a condition of less resistance from the very first.

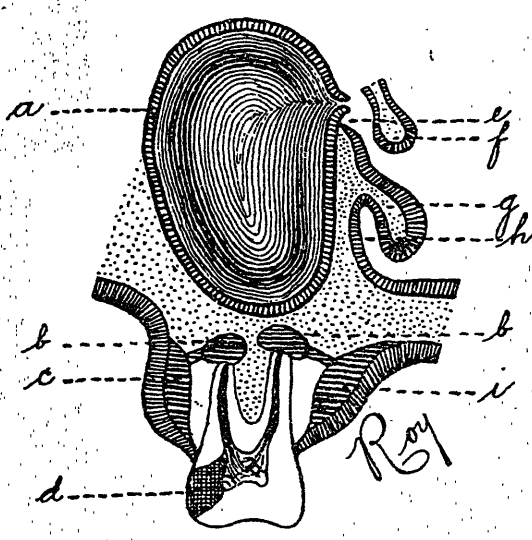

Fig. II.—Caries and dental abscess.

a. Normal mucous membrane of the nose. *b.* Dental abscess. *c.* Abscess of the gum. *d.* Dental caries of the fourth degree. *e.* Middle meatus. *f.* Middle turbinated bone. *g.* Inferior turbinated bone. *h.* Inferior meatus. *i.* Abscess of the palatine mucous membrane.

Etiology of Maxillary Empyema.

The cavity of the maxillary sinus, regarded from its anatomical relations, can be infected through two different tracts:

1. Infection following a case of periostitis and dental abscess, perforating the alveolus and the mucous membrane of the sinus, an hypothesis which will occupy most our attention in this communication.

2. Infection coming from the nasal fossa by the natural opening of the sinus which is situated in the middle meatus. I will not delay longer on this last mode of infection, but will proceed immediately to dental causes.

An abscess at the apex of the root of a tooth can find its way to the external surface in three ways:

(*a*) Pus can go toward the interior surface, toward the side of the roof of the mouth, lift the mucous membrane, produce a sub-periosteal abscess, and later produce a palatine fistulous opening (Fig. 2).

(*b*) Toward the exterior, toward the gum, and produce a gingival fistulous opening (Fig. 2);

(*c*) Upwards, perforating the floor of the sinus, and lifting the mucous membrane without destroying it (Fig. 3).

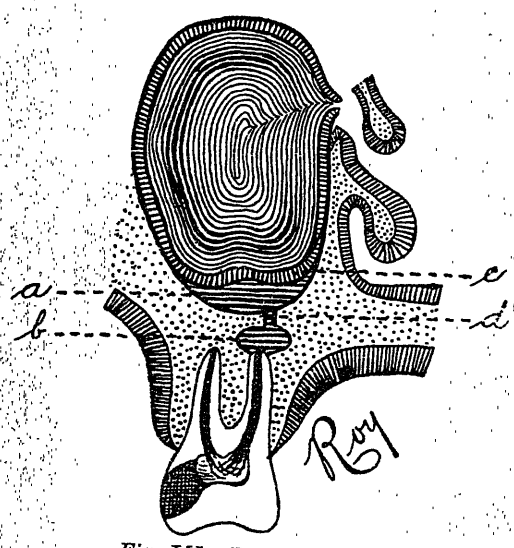

Fig. III.—Blind Abscess.

a. Pus in the sinus. *b.* Apical abscess. *c.* Sinusal mucous membrane lifted by pus. *d.* Perforation of the floor of the sinus.

When pus has remained a certain length of time in this cavity, the mucous membrane of the sinus degenerates and is perforated. This cavity being filled with pus, we are then in presence of a case of maxillary empyema (Fig. 4).

In certain cases, the alveolus and the mucous membrane of the sinus are perforated together without lifting of the membrane by the pus. Such is the mode of formation of this affection so well studied recently by Mahu, whose works have inspired me.

Differential Diagnosis of Maxillary Suppuration.

A patient complaining that when blowing his nose, pus comes out, should be examined methodically so as to find out where it originates.

Naturally here, I am referring to the maxillary sinus. We have at our disposal several means of diagnosing the case, viz.:

1. Examination of the nose; 2. examination of the teeth; 3. examination with electric lamp; 4. exploration puncture; 5. sign of Mahu; 6. sign of Guisez-Guérin.

1. *Examination of the Nose.*—When making anterior rhinoscopy, we see pus coming from the middle meatus. In certain cases there are polypi. Posterior rhinoscopy oftentimes discloses pus coming from the choanæ and spreading on the velum palatum. Allow me to mention also Fränkel's sign, which consists of cleansing the patient's nose, and then to make him keep his head bent forward for a few minutes.

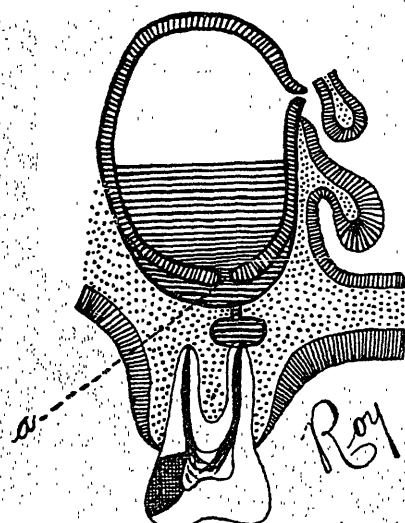

Fig. IV.—Maxillary empyema.

a. Perforation of the sinusal mucous membrane and influx of pus in the cavity.

If another examination shows pus in the middle meatus, we may conclude there is maxillary suppuration.

2. *Examination of the teeth.*—The teeth are next carefully examined, especially the first molar, which is most often involved in these affections. According to de Croës—dentist—the teeth which are most apt to produce infection of the sinus, are the following in order of frequency:

1. First molar; 2. second bicuspid; 3. second molar; 4. first bicuspid and cuspid; 5. third molar.

Caries of the fourth degree, fistula of dental origin, also pain on percussion ought especially to draw attention.

3. *Transillumination.*—(*a*) Heryng's sign.—Examine patient in a dark room. A small electric lamp of six or eight volts is put in the mouth of the patient, who is instructed to close the lips. Both sides of the face should be equally translucent. If one side is darker, there is probably pus in the corresponding sinus.

(*b*) Vohsen-Davidsohn's sign.—When a lamp is used as above described, the pupils are luminous when normal. If one is dark, we probably have a suppuration of the antrum of Highmore; this sign is of great importance.

(*c*). *Garel-Burger's sign.*—In the normal condition, the eyes being closed, the patient ought to perceive the light on both sides, the lamp being placed in the mouth.

Luc says, however, that the diagnostic value of these signs is not infallible. Thus a thickening of the bone of one side of the face, can obstruct transillumination of the eye or the sub-orbital region, without suppuration of the sinus.

Again, we come across exceptional cases in which the pupil is translucent, even though the operation reveals a maxillary empyema.

4. *Tapping.*—To Moritz-Schmidt is given the honour of first having had the idea of tapping the maxillary sinus. This is done with a special trocar which is pushed into the antrum through the cocainized inferior meatus, at about four centimeters from the entrance of the nares. We can also penetrate by way of the middle meatus, but there is danger, especially for the eye. The needle removed, an antiseptic lavage is made of the sinus, through the canicula; if there is pus, it passes out through the ostium. When no pus is washed out, we must not necessarily conclude that there is none; for we have observed cases where a membranous diaphragm divided the sinus into two parts.

5. *Mahu's sign; sign of capacity.*—This sign is based on the fact that there is no chronic maxillary sinusitis without a thickening, more or less considerable, from the very first weeks; and later a fungous and myxomatous degeneration of the mucous membrane of the sinus, and, consequently, a marked and always noticeable diminution in the capacity of the sinus. This test is made in the following way: let the patient sit holding the head steady and straight. Apply cocaine, puncture the sinus with a trocar by way of the inferior meatus, wash thoroughly to get rid of enclosed pus. The cavity is filled with fluid to level of the ostium, the excess passing out by this opening. To the canicula adjust Roux' syringe; by pulling out the piston very slowly, the liquid which fills the sinus is drawn into the syringe. Then the capacity of the antrum will be indicated in cubic centimetres.

Mahu concludes by saying: "Whatever may be the capacity of the "sinus in a normal state, we conclude the existence of a true chronic "maxillary sinusitis whenever the quantity of fluid aspirated is less "than 1½ cubic centimetres; and that there is maxillary empyema "when the quantity is greater."

6. *Guiscz-Guérin's sign.*—After having recognized a maxillary suppuration by the darkness of the cheek and of the pupil with the electric lamp, and having corroborated the diagnosis by puncture, we examine again with the light. If this time the pupil is translucent, we diagnose an empyema, if still obscure a maxillary sinusitis.

Treatment of Maxillary Suppuration.

A.—Empyema of the sinus.—Whatever may be the origin of the maxillary suppuration, it is the attending doctor's duty to get his patient's teeth examined by a dentist, so that he may treat him more scientifically. When maxillary empyema is diagnosed, and the teeth seem to be the cause of the trouble, Lermoyez expresses himself as follows: "Extraction of the diseased tooth should be effected very "carefully so as not to create a communication between the alveolus "and the sinus, should this not already exist. This done, two con- "ditions present themselves. When the sinus communicates with the "mouth, we must take advantage of this opening to wash out the sinus, "but more especially without enlarging the opening, and without put- "ing in a drainage tube. It is only in the case of small alveolar "sequestra existing, that one is justified in curetting and cauterizing "the alveolus so as to hasten its cure. When the sinus does not com- "municate with the mouth, we must be careful not to make such "communication and evacuate the pus of the empyema by means of "irrigation through the nose."

In the case of empyema of buccal origin, the abscess being opened by the extraction of a tooth, it is an easy matter to cure this disease by a few antiseptic washings of the sinus. The drug employed ought to be very well diluted; because we depend more on the mechanical effect of the irrigation than on the antiseptic action of the drug itself.

In case of a patient refusing the extraction of a molar tooth, the dentist could, perhaps, try drainage of a dental abscess, and even evacuate the pus of the sinus by washing, using the palatine root of the molar tooth. This root is always the most at fault in empyemas of dental origin, and sometimes it is in direct relation with the mucous membrane of the sinus. However, the result is always doubtful, and oftener we are forced to resort to extraction.

If washing of the sinus is done through the nose for a nasal empyema, it is better to tap through the inferior meatus at once. In truth, it is very difficult to wash thoroughly this cavity by its natural opening, for, on account of the complicated anatomy of the part, the fluid would have to travel back by passing near the canula, and the washing would be incomplete. Hajek and Lermoyez have made the following experiment: A lavage of the sinus is made through the ostium and the fluid comes out clear; immediately after a puncture through the inferior meatus brings out curdy pus. This proves that the fluid penetrating by its natural orifice reaches the maxillary sinus by its upper part, and comes out at the same point; so that the stream does not wash the floor of the cavity thoroughly.

B.—True maxillary sinusitis.—When the diagnosis of true maxillary sinusitis has been thoroughly established by means of the ingenious methods of Guiscz-Guérin and of Mahu, the patient is again instructed to call on his dentist if the trouble is suspected to have originated by the mouth. The latter, after having extracted the carious tooth, should be careful not to open the sinus, and more so to put in a drainage tube. However, should he suspect periostitis or a sequestrum, he would be justified in attempting its removal. Very often his efforts will be useless, and the sequestrum will be removed only by radical operation. It is better to cure the gums before treatment of the sinus, because the existence of an alveolar fistula is unfavourable for the success of a later operation. I will not speak of lavage here; because in a true sinusitis antiseptic irrigations are not sufficient to cure a mucous membrane in a state of fungous and myxomatous degeneration. It is then necessary to adopt a more surgical treatment which will allow perfect curetting of the antrum of Highmore. There are three principal ways of reaching the sinus:

1. Claoue's method.
2. Desault's method.
3. The radical operation of Caldwell-Luc.

A.—Claoue's method.—This operation, as practised by the author, consists of three steps:

1. *The removal of the anterior two-thirds* of the turbinated body. This is removed with scissors close to the nasal wall.

2. *Resection of the wall.*—The sinus is opened by means of a trephine or by an electric drill. The opening is begun about two centimeters from the anterior extremity of the turbinated body, and is carried back far enough in this manner to admit freely the tip of the thumb.

3. *Cleansing and dressing of the sinus.*—The sinus is washed, the largest buds only are removed with the curette. The aim of the author is not a thorough curetting, but a drainage. The cavity is touched with chloride of zinc and is packed for forty-eight hours with iodoform gauze. The following days, wash the parts, and blow in a non-irritant powder, after having dried the mucous membrane of the sinus.

This method presents advantages and disadvantages. The only plausible advantage is that it does not necessitate a general anesthesia. According to its author, the operation is not very painful and is easily performed, if the turbinated body has been well removed.

Among the many disadvantages of that intra-nasal operation, the greatest criticism which one can make is that it does not allow a sufficient exploration of the sinus, and consequently a complete curettage is impossible. Moreover, nowadays, it is a recognized fact that the success of an operation depends on the thoroughness with which it is practised. And again, the author himself acknowledges that his method would have been powerless to cure certain patients who were definitely cured by a Caldwell-Luc's operation.

B.—Desault's method.—This operation consists in opening freely the anterior wall of the maxillary sinus, after having cut the gingivo-labial mucous membrane at the point of union. The antrum is then curetted with care, drainage is established, but the buccal wound is not sutured. The secret of this method is to watch daily the progress of epidermization which takes on an average a year and a half. The doctor should keep the wound opened, and watch that there is no formation of new buds in the antrum. When the patient is cured he should wear a prosthetic appliance to close the opening of the sinus.

Among the advantages of Desault's method, we should recognize that when we have a sinus in which the orbital wall is attacked by osteitis, the watching of the bone repair is rendered very easy through the opening into the sinus. However, its only superiority over Caldwell-Luc's method, is in the case of extensive alveolar osteitis, due to dental lesions. For the cure to be definite, it is necessary to make a large resection of the whole alveolar border, and sometimes to remove part of the floor of the sinus. Then, under these circumstances, it is impossible to attempt the reunion of the gingival wound, because the rough edges would invariably be attacked by sphacelism. Moreover, it is contra-indicated to make a naso-sinusal opening.

This method, like the preceding one, presents also disadvantages:

1. The patient has to undergo numerous dressings, accompanied by curetting and cauterization of the sinus for nearly two years.

2. The opening has a great tendency to close, and every day the patient should insert his finger into it.

3. The food can be masticated on one side only, and to quote Luc's picturesque expression, the patients are condemned to eat everything "à la sauce iodoformée."

4. Add to this the wearing of a prosthetic apparatus.

C.—Caldwell-Luc's method.—The radical cure of maxillary sinusitis by this process is certainly the greatest invention of the surgery of the antrum of Highmore. Caldwell of New York, in November, 1893, published an article on this subject giving the description of this operation. However, his work appears to have passed unnoted even in his own country. In May, 1897, Luc of Paris, gave to the "Société Française d'Otologie," a communication on this method which bears his name. He declares having noticed the article of his American colleague, more than a year after his own experiments. Following is a description of the six stages of this radical cure:

1. *Incision of the mucous membrane.*—The patient is anæsthetized with chloroform, and a pledget of cotton is placed between the molars, to absorb the blood and prevent its falling into the larynx. It should be changed often. After pushing away the upper lip, the head is turned slightly toward the operation side, and a cut is made in the gingivo-labial groove, from the first molar to the canine tooth.

2. *Opening of the sinus.*—The anterior wall is opened with the chisel and mallet, after having been well rugined. The opening should be large so as to allow a free access to the instruments, and will end on the internal wall.

3. *Cleansing of the cavity.*—The sinus should be very carefully scraped, for on this depends the success of the operation. Attention should be paid to the angles, and Luc's currette will be indicated here.

4. *Creation of an artificial opening.*—The inferior turbinated body is removed with the Laurens' forceps, and a large sinuso-nasal communication is established, preferably with Lombard's forceps. The opening should be on the floor of the sinus so as to facilitate drainage.

5. *Naso-maxillary drainage.*—The sinus is very carefully dried, and then cauterized with a solution of 1 in 20 of zinc chloride. We push in the antrum a piece of iodoform gauze, which is brought out through the corresponding nostril, and the remainder of this is lightly packed into the sinus.

6. *Reunion of the buccal wound.*—The wound is sutured with catgut by a continuous stitch starting from the external angle. A small needle specially curved will be useful.

The cheek is generally swollen on the day following the operation. The mouth is gently washed with an antiseptic, and during the first days the patient is fed on liquid foods. About the fourth or fifth day, the iodoform gauze is removed, and we begin a series of irrigations. The average of five weeks is generally sufficient to bring about a complete cure, by the formation in the sinus of a fibrous tissue epidermized by the epithelium of the nose.

We cannot recommend too strongly Caldwell-Luc's method as the operation to be preferred for true maxillary sinusitis, because it has all advantages over the others. However, as we were saying above, we will make an exception for the cases of necrosis of the alveolar border with osteitis of the floor of the sinus, where we should use Desault's method.

Allow me to relate here the case of a patient who was operated by the Caldwell-Luc's method, and who had previously been operated upon by the Claoue's method.

Case.—Mr. J. S., aged 24, recommended to me by Sir William Hingston, came to the Hotel-Dieu Hospital for consultation on the 20th of July, 1905, for an affection on the right side of the nose.

He has lived in Canada for a year, and is a binder by trade.

Personal history.—He tells us that since five years pus comes from the right nostril, but cannot tell if it came after a cold in the head. He had had scarlatina and measles in childhood. He has also had slight attacks of rhinitis without being subject to this disease. Excepting the above mentioned fevers, he has always been healthy .

Family history.—His family is in excellent health, and his history reveals no diathesis which might explain the local disease.

Physical examination.—By means of anterior rhinoscopy, we find a total absence of the right inferior turbinated body. There is a large communication between the nose and the sinus. The entire nasal fossa is covered with pus which seems to take its origin in the antrum. Slight hypertrophy of the left inferior turbinated body.

Posterior rhinoscopy reveals a small quantity of pus coming from the choanæ; catarrhal pharyngitis. The larynx is normal.

All the upper right teeth have been removed. The patient said he had them extracted two years ago because they were carious and pained him. The gum is well healed.

A lavage of the sinus brings out a large quantity of pus, and the right cheek and pupil are obscure when examined with the light. The left side is normal. There is no tuberculosis nor specific history. Absolutely normal state of all the other organs.

The patient tells us that on the 10th of March, 1905, he underwent an operation on his nose in one of the hospitals of the city. The following days they washed out the sinus, and put in a strip of gauze. He followed this treatment since the above date, that is, more than four months; and, as there is no change, he gives up hopes of cure, and it is then he comes to us.

It was evident we had a case of maxillary sinusitis that Claoue's method had failed to cure. After explaining to him his trouble, we propose a second operation which he accepts, and which was done on the 27th of July, 1905.

Operation.—Anæsthesia of patient with chloroform, incision of the gum at the point of election after Luc's method. Large opening in the anterior wall of the sinus which is filled with pus and fleshy buds; thorough curetting of this cavity, cauterization with zinc chloride. Drainage of the sinus with a strip of gauze passing through the nasal opening made at the first operation; suture of the lips of the wound.

The results were excellent; we removed the drain on the fourth day. We then begin daily irrigations of the cavity, and five weeks after the operation the patient was definitely cured.

If this operation of Caldwell-Luc has given a result more beneficial to the patient, it is because we were able to thoroughly curette the sinus.

Conclusion.—In presence of a suppuration of the antrum of Highmore, it is necessary to make a differential diagnosis between empyema and true maxillary sinusitis. We have for that the signs of Guisez-Guérin, and especially that of Mahu, which will be of great help.

We then see if the trouble is of nasal or of dental origin. In the last case the diseased teeth must be extracted, and if we have a case of empyema of the sinus communicating with the perforated alveolus, we must wash without putting in a drain. It is now recognized that it is better not to use the canula, because it may retard and sometimes stop the cure, by epidermization of the dental tract.

If the origin is nasal, the neighbouring sinuses must be treated, and a few punctures made in the inferior meatus.

When we have a true maxillary sinusitis we should equally see if the teeth are the cause; and, after having had these attended to, we should open the antrum through its anterior wall.

Claoue's method should be followed only on patients who cannot be anæsthetized.

Desault's method is suitable only for a case of sinusitis complicated with necrosis of the dental alveolus, and part of the floor of the sinus.

In all other cases, we should use the excellent method of Caldwell-Luc, which will give us a prompt and definite cure.

This, gentlemen, is the path we should follow in presence of a maxillary suppuration.

SOME NOTES ON OPSONINS.

BY

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In trying to establish the relative parts played by the various elements of the blood in the process of phagocytosis, it was found that the leucocyte was not so independent as has been held by some observers. It became evident that the phagocytosis depends on an effect exerted on the bacteria by the blood fluids, at any rate some element of the blood independent of the leucocyte. Thus leucocytes suspended in a medium other than the serum normal to them, physiological saline, for instance, did not show anything like the phagocytic power of leucocytes in the normal blood fluids. In other words, in an encounter between leucocytes and cocci in a menstruum of saline, the phagocytosis was much less marked than that observed in a menstruum of cell-free serum of any kind.

The following points were next established in this connection:

(1) The substance, evidently in the serum, by acting on the bacteria, prepares them for ingestion by the leucocyte. Its independence of the leucocyte is established by the fact that variation in the number of leucocytes in the blood does not cause a proportionate variation in the phagocytic power. From this preparatory action, the substance has derived the name opsonin.

(2) The activity of the opsonin may be destroyed by heating to 60 degrees for ten minutes; it is also found to deteriorate and gradually disappear in vitro.

(3) The dependence of phagocytosis on the serum rather than on the leucocyte was further shown by the fact that in the presence of a normal serum, the leucocytes of a person suffering from, say, furunculosis, would take up just as many bacteria as would those of a normal person. If, however, the affected person's serum was used, the number of cocci taken up by his leucocytes would be much smaller than on the previous occasion.

It has also been demonstrated, that if the serum of an individual whose phagocytic power has been artificially raised, be allowed to come

in contact with the leucocytes of a normal individual, those cells will show the increase in phagocytic power noted in the individual under treatment. Per contra, the same individual's leucocytes in contact with the blood of a normal individual would show a normal phagocytic power.

(4) A distinct opsonin is found for each invading organism. The only exceptions to this statement hitherto found, are the Klebs Löffler and the Xerosis Bacillus, both of which are insensible to any opsonic action of the blood fluids. The specificity of the opsonins has been demonstrated by removing all the opsonin of a given species of organism from a given serum, by allowing it to come in contact with a strong emulsion of that organism. After removing all traces of the bacteria, it is found that leucocytes introduced into that serum have no phagocytic power as far as the particular organism is concerned, while they still retain it for organisms of different varieties.

(5) The opsonins have been shown to be independent of the bacteriolysins and agglutinins. They co-exist almost always, and there is reason to believe, in the case of pulmonary tuberculosis, at least, that the abundant presence of the latter may go hand in hand with an increase in the opsonic power. In cases of tuberculosis with a high or rising opsonic power, the tubercle bacilli in the sputum tend distinctly to clumping.

By the term "opsonic index" is meant the relation of the phagocytic index (obtained by dividing a total number of bacteria incorporated by a total number of leucocytes incorporating) of the serum of the diseased person to that of the healthy person.

The following important generalizations have appeared justified from the investigation of a large number of opsonic indices:

(1) The index remains practically constant in the same individual from day to day, but it may be distinctly lowered by severe bodily exercise.

(2) When the infection is well localized, the index as a rule is low. This generalization has been made largely on the observation of cases of furunculosis, acne and sycosis. It does not appear to be true of incipient and well localized cases of pulmonary tuberculosis. Here the index tends to be above normal.

(3) In cases where the disease is well localized, there is found coincident with the rise and fall of the opsonic index a fairly constant improvement and aggravation of the clinical aspect of the case. The argument that the low phagocytic power found in these well localized cases of bacterial invasion is a result and not a cause thereof, is met

with the statement, that "it is infinitely more probable in view of the entire absence of symptoms in the milder cases of staphylococcic infection, that it is the defective phagocytic power of the patient that furnishes to the staphylococcus, which is normally present on the surface of the body the opportunity for invading the skin."

The low index in these cases is explained by the probable absence of any auto-intoxication of an amount sufficient to produce a general reaction on the part of the body as a whole.

(4) In cases in which the infection is not well localized, or in which it is systemic, the index will be found to vary between greater or less extremes of height or depth. This is held to be due to the varying amount of toxin discharged into, or present in the body at large, and the variation of the bodily reaction thereto.

The principle of treatment evolved from these observations is the production of an active immunity in the elaboration of which the tissues of the patient are educated, as it were, by the introduction into them of vaccines. Under the head of vaccines are classed attenuated living cultures of the invading organism, sterilized cultures and derivatives of such cultures. The procedure is to be recommended only in cases in which the disease is well localized, for the reasons (1) that in such cases only the products of the metabolism of the bacteria are absorbed, as distinguished from the substances in the bacterial protoplasm which evoke a production of antibacterial substances. (2) On account of the danger of adding fresh toxine to that already present in the body the treatment would be out of place in cases in which the infection was evidently general or in which wide variations in the opsonic index showed a tendency to generalization.

The responsible organism then is isolated, a vaccine thereof made (in cases of tuberculosis, Koch's tuberculin TR. diluted with 0.75 saline is used) and injected into the patient. This procedure is followed by a very generally observed fall in the opsonic index, due it is supposed to the increment of toxic material in the system. This is what is known as the negative phase of the curve of immunity. The reaction of the body, which usually follows within twenty-four hours, is expressed by a rise in the index and is known as the positive phase. Of course the only way of recognizing the presence of a positive or negative phase is by ascertaining the opsonic index and on this the course of the treatment depends. From the moment the index begins to turn, it increases steadily through what is known as the "flow and reflow" until it reaches or exceeds its previous height. At this point it remains constant for a shorter or longer period of time. The same

phenomenon of positive and negative phase is observed after each injection, with the eventual production in many cases, at any rate, of an index at a higher base line than at the commencement of the injections. Coincident with the attainment of the higher index is the amelioration or disappearance of the local invasion.

The injections must be so timed as to coincide with a positive phase, inoculation during a negative phase will result in a lessening of the powers of immunization and in harm to the patient. It means a superaddition of negative phases. Injections on the other hand, at the period of the positive phase increase the opsonic index more or less permanently and so they produce a higher state of immunity with whatever it may imply. Ignorance or disregard of the succession of phases is held to account to a large degree for the failure that has attended the production of antitoxic sera other than that of diphtheria, both as regards the serum-yielding animal and the patient. In the latter case the mistake already referred to has been made, and in the former, the serum has been withdrawn during the negative phase of certainly lessened immunity and, perhaps, positive toxicity. The success in diphtheria is thought to be due to the extreme susceptibility of the guinea pig to the diphtheria toxine which makes it possible to eliminate all toxic sera (negative phase sera) from use.

From the experience gained thus far of this method of treatment it would appear that many cases of chronic straphylococcus infection, such as are to be seen in acne forunculosis, sycosis and impetigo contagiosa will yield readily and completely to it. As long as there remains a focus of disease the patient is liable to re-infection. In pulmonary tuberculosis the best results appear to be had in "the chronic cases of phthisis which, with a fair amount of the disease and a fair amount of cirrhosis and healing, are nevertheless practically stationary . . . ."

In surgical tuberculosis, the focus should be removed by the knife as completely as may be and that after the opsonic power has been raised as much as is possible. This stage of higher immunity should naturally be maintained. It follows from this, that no operation should be performed or injection proceeded with during any but the positive phases. In spite, however, of the utmost care taken in the timing of the injections with regard to the positive phase of immunity, cases will be found that will not be benefitted. All depends on the individual's power of response.

The use of the opsonic index as an aid in differential diagnosis depends on the generalizations already referred to, and largely here on the specificity of the opsonins.

In tuberculosis the normal index is relatively low. The statement has been made, that a person whose index to tubercle bacilli is lower than 0.8 or higher than 1.2 is probably tuberculous.

SOME RECENT ADVANCES AND PROBLEMS IN BIO-CHEMISTRY.*

BY

PROF. R. F. RUTTAN.

The practice of medicine so far as it is strictly scientific is based upon principles established by physiology, pathology and pharmacology. The history of these three concrete sciences shows that they have become more accurate and scientific as their generalizations come to be based upon the experimental results of biology, chemistry and physics. So in turn chemistry is largely based upon physics, as the latter is upon the abstract science of mathematics. Each concrete science becomes more accurate and reaches nearer the exact truth by adapting the principles and theories of the more abstract and experimental sciences which are basal to it. As Osler says: "The study of Physiology and Pathology within the past half-century has done more to emancipate medicine from the routine and thraldom of authority than all the work of all the physicians from the days of Hippocrates to Jenner, and we are as yet but on the threshold."

The great problems of biology which lie at the foundation of physiology and pathology have been resolved into factors which are being studied by aid of the atomic theory, and Newton's law of motion. It would seem, indeed, as though all other lines of research and avenues of progress in medicine have become during the last four or five years comparatively deserted for those where advances are made through the technique and theories of chemistry and physics.

That field of science which lies between chemistry proper and physics, the so-called "Physical Chemistry," has advanced of late years with giant strides. The most important recent development of this branch of science has been characterized by the establishment of comprehensive principles which fertilize the whole foundations of chemistry and promise nourishment to all branches of chemistry for the future. The researches of Van t'Hoff, Arrheneus, and others have altered and broadened the view of chemists regarding the nature of chemical affinity, the condition of matter in solution and the distribution of energy in chemical

* Abstract from Introductory Lecture of the Medical Faculty of McGill University for Session of 1906-07.

reactions. No field of chemistry has been enriched to a greater extent by physical chemistry than that of physiological or bio-chemistry. The two pillars upon which the edifice of modern physical chemistry rests, are the application of the theories of thermodynamics to chemical problems, and the theory of solutions. The laws of solutions find in physiology applications of the highest importance; on the other hand, the principles of thermodynamics have not, up to the present time, been introduced to explain or elucidate any of the important problems of physiology.

The modern theory of solutions contains two important principles: 1st, The extension of Avogadro's law of gases to dilute solutions. Avogadro's law of the relation of the number of molecules in a gas to its temperature and pressure is one of the greatest generalizations of chemistry. The extension of this principle to dilute solutions marked a great advance in our knowledge of matter. It may be briefly stated as follows:—Two solutions of different substances having the same osmotic pressure and of the same temperature, contain the same number of molecules, *i.e.*, matter in dilute solution behaves as a gas.

The second generalization in connection with the theory of solutions is, that solutions of substances which conduct electricity, that is electrolytes, consist not of molecules of the electrolytes, but these molecules of acids, bases and salts dissociate or break down into ions. Thus, a solution of sodium chloride, when dilute, consists almost entirely of ions of sodium and ions of chlorine and one of hydrochloric acid, of hydrogen ions and chlorine ions. This ionization of electrolytes occurs almost entirely in aqueous solution. Recent chemistry teaches that all reactions of electrolytes in solution take place between the ions.

The importance of this complete change of view with regard to the nature and reactions of salts in solution to the physiological chemist is very obvious. The human body consists of over 63 per cent. of water and the cell protoplasm of 80 per cent. The materials for the nutrition of the cells of the body are conveyed to them in aqueous solution; the chemical reactions which go on in these cells are carried on in aqueous solution; the worn out material, the result of cell action, is carried away also in a condition of aqueous solution or suspension; hence the chemistry and physics of substances in aqueous solution are of paramount importance in the study of physiology. It has been found that the amount and nature of the material in aqueous solution, as predicted by Avogadro's principle, affect the osmotic pressure, the freezing point, boiling point, etc., of the solution. Hence, very much of

practical value, both in physiology and pathology, has resulted from the accurate measurement of the physical characters of the various fluids of the body. Much light has been thrown upon the character of the substances in solution in the blood by study of the osmotic pressure of defibrinated blood, its freezing point in various conditions of health and disease, and quite lately a study of the viscosity or internal friction of human blood in health and disease. The determination of the freezing point can now be made with rapidity and exactness by a modification of the apparatus used for determining molecular weights, and it is an instrument regularly used in the hospitals of Germany. The cryoscopic reaction of urine is a routine test in many hospitals.

The view that salts, when in dilute solution are almost completely ionized, whereas in more concentrated solutions the ionization is less complete, has led to a revision of the physiology of solutions containing electrolytes in the body. The physiologist now looks to the ion for the stimulating or depressing effect of an electrolyte, and the pharmacologist studies not the action of a salt but the ions of that salt.

Solutions of electrolytes may act upon living cells either chemically or electrically, or both. The subject is at present in process of development; it is in the laboratory stage. Matthews, for instance, has reached the generalization that all anions have a stimulating, and all kations a depressing action upon bioplasm in general. It is also fairly well established that there is a connection between the valency of an ion and its physiological action. An ion with high valence carries a greater number of electric charges and the depressing or stimulating effect of a salt varies according to the increased valency of the kation or anion. The valency of an ion is not the only explanation of the physiological action of a salt; it is found that it also depends upon the tendency of an ion to give up its charge, *i.e.*, its electrical stability, or, as it is called, its ionic potential.

In addition to the chemical and physiological action of ions, the physical chemists are studying their effect on bioplasm through their power to alter the state of such colloid aggregations, and their effect upon surface tension.

Besides the ionic action of electrolytes, they may alter the properties of the cell contents by osmosis or by affecting the activities of the ferments or enzymes. The extension of Avogadro's principle to solutions has made the measurement of osmotic pressure in living tissue a possibility.

Osmotic pressure can be measured directly only with the greatest difficulty; but indirectly the law governing solutions enables us to do

so, by taking the freezing or boiling point of the solution, determinations which can be made with great accuracy, owing to the improved technique of the physical laboratory. The accurate study of osmotic pressure in the different organs of the body has enabled physiologists to reach certain very important conclusions.

The solutions in the tissues diffuse from cell to cell through membranes similar to those which outside the body obey the laws of osmosis. Some of the earliest studies made in connection with osmotic pressure of aqueous solution of salts, were made by the use of living animal and vegetable cells. The investigations of de Vries on the walls of vegetable cells, and later the work on osmosis by the celebrated Dutch physiological chemists, Donders and Hamburger, were made on the delicate membrane which bounds the red blood corpuscle. The results obtained by the study of the passage of fluids through these living membranes were similar to the results obtained later when experiments were made upon the artificial semi-permeable membranes; that is to say, that the passage of fluid through the living membranes seemed to conform exactly with the laws of osmotic pressure as ascertained by the use of semi-permeable membranes in the laboratory.

The walls of living cells by no means play the part of an inert membrane to which the laws of osmosis apply. The action of kidney cells, for instance, is nearly opposite to that of the semi-permeable membrane. instance, is nearly opposite to that of the semi-permeable membrane. There is, therefore, in these cells an energy transformer, a force other than those with which we are acquainted in the study of the energy of non-living matter. The resolution of this vital force, or biotic energy, into terms of chemical energy, etc., has not yet been accomplished. This mysterious form of energy is being studied by the methods of the physical laboratory, just as the study of other manifestations of energy is made, viz., by observing the interactions between this form and other known forms of energy. It may be considered as established that no similarity exists between diffusion of solutions through living membranes even the thinnest, and diffusion through dead semi-permeable membranes. The former can only be studied in conjunction with a form of energy peculiar to the living cells.

One of the most startling discoveries of recent years was made by Prof. Loeb at Chicago University, viz., that osmotic pressure can partially replace the act of fertilization of the eggs of certain sea organisms. These eggs in sea water remaining unfertilized die very rapidly. By an elevation of the osmotic pressure, by the addition of any one of a number of salts or sugar or urea, the development and segmentation

of the egg proceeds until the organism begins to have independent movement.

The chemistry and physics of the solutions of the body, is further complicated by the presence of the so-called colloids. These sometimes form solutions; they diffuse scarcely at all through animal membranes; sometimes they are partly dissolved and partially suspended (forming the so-called "Solution Aggregates"); they are thrown out of solution by electrolytes; they are themselves non-conductors of electricity; they possess extremely high molecular weights, and their solutions have a correspondingly low osmotic pressure and low diffusion velocity.

To this group of bodies belong the proteids and the enzymes.

The colloid constituents of the body are, from a chemical standpoint, the most difficult of all to investigate. Not only are they made up of molecules of extraordinary size and complexity, but they are extremely difficult to obtain in a pure state. They are so unstable that the atoms in the molecules seem to shift their relative positions under chemical action, like grains of sand on the sea shore. This is especially true of the molecules of the substances called albumen and the enzymes.

A problem of fundamental importance in biological chemistry to-day is, What is the exact composition of the proteid molecule? This molecule, consisting as it does of many hundreds of chemical atoms, stands alone in its importance. It is the basis of cell action, and it is the chief constituent of the structure of living organism. Is the problem of the composition of this giant among chemical molecules one which lies beyond human powers to solve?

A knowledge of the constitution and actions of albumen and the enzymes must precede and form the basis for all investigations of those mysteries which underlie the phenomena of cell life, self preservation, development and reproduction.

It is one of the hopeful signs of the times that this forbidding field of chemical research, this "darkest Africa" of the chemical world, beset with such apparently insurmountable barriers to chemical investigation, has recently attracted to itself several of the greatest living chemists and physicists. Formerly, with few exceptions, the expeditions to penetrate this dark jungle were led by physiologists, pathologists or bacteriologists; brilliant men, with original minds, and unsurpassed industry, but without the technique and special training which are essential to progress in this field of research. Now, with such men as Emil Fischer and Van t'Hoff of Berlin, Bredig of Heidelberg, Seigfried, Luther and Ostwald of Leipzig, together with many others known to fame, we have leaders who are trained chemists and physi-

cists, with lifelong experience in one line of research, and these are devoting themselves, training and inciting others towards a solution of the physico-chemical problems which lie at the very foundation of a rational physiology, and hence a rational pathology.

Nothing in chemistry or biology is more fully established and recognized than the fact that we are densely, absolutely, ignorant of the dynamics of life and the constitution of any protoplasmic body. It is, however, an intensely interesting thing to see with what resistless march Science seems now approaching the final investment of these two strongholds of ignorance, of which, the latter — the constitution of proteids—seems to be a key to the former. The persistent efforts of physiological chemists in the study of the products of proteolytic fermentation has of late years added enormously to our knowledge of proteids. The recent attack upon the stronghold—the albumen molecule—may be said to be the highest enterprise that a chemist has ever undertaken with any reasonable prospect of success.

A paper was given to the world by Emil Fischer of Berlin on the 6th of January last, entitled "Researches upon Amino-acids, Polypeptide and Proteine." In reading this paper it is difficult to say which commands the greater admiration, the author's consummate skill and endless resources in sweeping aside each difficulty as it arose in this most complicated field of experimental enquiry or his intense and ceaseless activity in producing, month by month, during the past five years a wealth of new knowledge, of new methods and new bodies of the first importance to biological science. Although biological chemistry has done much in the past in the way of classifying and naming the numerous members of the proteid group, in preparing a few members in a chemically pure crystalline form, in attaching to different members physiological functions, still our knowledge of their chemical constitution has, up to the present, been extremely small. We knew the molecules were enormously large, we knew the percentage composition in terms of carbon, hydrogen, oxygen, nitrogen, sulphur, etc., of many, but our knowledge of the proteids chiefly depended upon the products of hydrolysis by acids, alkalies and digestive ferments. When, by the action of acids, alkalies or enzymes proteids become hydrolyzed, that is, take into their molecule one or more molecules of water, they break down into what are called the degradation products.

Briefly, in order of formation, these consist of; various albumoses, various peptones and peptides, which further break down into amido acids or amino acids, as they are more properly called. About three-fourths of the albumen molecule is composed of bodies allied to glycocoll, *i.e.*, amino acids.

The albumoses and peptones differ in order of their solubility from the proteids proper and possess certain other reactions by which they are distinguished, but until the work of Fischer, the molecular structure of no one of the degradation products of the proteids more complex than amino acids was known. Some twenty-two amino acids have been obtained from the hydrolysis of various proteids. These are for the most part crystalline bodies which can be isolated, purified and studied by the methods employed in laboratories for organic chemistry. Some of them have even been built up from their elements while the structure of the molecules of most of them has been worked out chiefly by Fischer with great exactness.

Fischer set himself the task of piecing together these minute fragments of the proteid molecule, the amino acids, with a view of building up a body having the properties and characters of a peptone or an albumose. From the simpler members of this group he devised methods for building up more complicated ones and uniting these. By infinite trouble he obtained still more complex molecules which, when combined in a certain definite manner, produced a highly complex peptide called by him a polypeptide. This was found to possess the properties of the simpler members of the peptone group of bodies. Thus, by a slow process of sapping and mining extending over a period of some five years, has the first redoubt of this great citadel been captured, and it may prove a key which will open to us the most intimate structure of albumin itself. Fischer himself is confident of being able to reproduce some of the natural albumoses and peptones by an application of the methods and reactions employed in the synthesis of the simpler members already produced. But, as he says, in concluding his paper: "The problem of producing true albumins is of far greater difficulty, for their reconstruction from the first products of hydrolysis (peptones and albumoses), will require entirely novel methods, and when these are found their application will probably be a laborious process." One may therefore ask the question whether the eventual success will compensate for the labour expended. This depends, in my opinion, on the profit which biological research can derive from it, and this, again, on the manner in which the synthesis has been accomplished. For a synthesis made by the direct union of albumens and peptones might be compared to a tourist who rushes through a country in an express train and sees nothing. It is otherwise if the synthesis is constrained to advance slowly and to construct the molecule, step by step. It is then like a traveller journeying on foot, who notes every feature of the road, and tries each side path before the right one is found. He not

only learns every inch of the country, but understands the nature of its inhabitants. He knows his way and can direct others. I can only look upon it therefore as a piece of good fortune that synthesis demands the creation of countless new methods of construction, separation, and recognition, and the study of hundreds of intermediate products before the proteids themselves can be reached. For these methods may not only serve in the end to produce all the natural albumins, but bring to light many more which may eventually serve to explain the remarkable changes which contain proteids effect in the form of enzymes and toxines."

I am optimistic enough to believe that the colossal task of unravelling the structure of the higher proteid molecule is one which will be accomplished in the lifetime of many of those who are present.

Important as the result of this investigation of Fischer is, its value is enormously enhanced by the fact that in the process of building up those peptides, he has devised entirely new methods and a new technique for the investigation of the secondary products of the decomposition of proteids. He has thus furnished the whole chemical world with new and efficient tools by which to continue the work so well begun. But, after all, the greatest value of this most magnificent contribution to biological chemistry is not so much the actual benefit which it has conferred upon physiology and pathology, as the clear prophecy which such a work utters of greater discoveries to come.

The advances in physical chemistry, especially in the studies of the laws and phenomena of solutions, both of crystalloids and colloids, have gained for us our closest approach to the phenomena occurring in a living cell. Our knowledge of the chemical dynamics and the transformation of energy which distinguish living from non-living matters is very small indeed. We know, however, and can demonstrate by experiment, that the two fundamental laws of the non-living world, viz., the Conservation of Matter and the Conservation of Energy, are obeyed throughout the whole range of organized nature. We also know that the sources of the energy of living cells are the same as for non-living systems of energy and that the sources of the matter of which living cells are composed are the same as for non-living matter, and, finally, it is no longer seriously disputed that chemical processes in living matter are specifically the same as those of the chemical laboratory. The first great step towards a recognition of this important fact, viz., the similarity of living and non-living chemical reactions was made by Lavosier, who demonstrated by experiments upon animals, in 1780, that respiration and combustion were but different phases of the same process, viz., oxidation. Nearly

fifty years later, in 1828, the synthesis of urea by Wohler led to the complete downfall of the belief in an inscrutable *vis vitæ*, an unknown and unknowable animal force. The acknowledgement on the part of the medical profession, a century ago, that they not only did not know, but could never know, anything about the substances composing the body, or their mode of action at once suggested that all scientific investigation regarding the cause of disease was superfluous. It caused a wretched delay in the progress of the science of medicine, as it closed for nearly three-quarters of a century the only path in science which leads to discoveries of value, namely, the experimental method, and left medicine dependent wholly upon empiricism and tradition.

We should be careful, however, not to allow the reaction following our liberation from the bondage of the old view of a mysterious vital energy in no way co-related to the known forms of energy, to carry us too far. Probably the German school, which holds that there is in the living cell no form of energy whatever which is not to be found in non-living matter, is taking an extreme view. It is one, however, with which we cannot help having the greatest sympathy, as it encourages investigation and stimulates research.

There is another school, an English school, which holds that there is a force, called Biotic Energy, to give it a name, which is peculiar to living matter. This school defines this form of energy as follows:—"The "conception is that biotic energy is just as closely and no more related "to the other forms of energy existing apart from life, such as heat, "light and electricity, as these are to one another, and that in the "presence of the proper and adapted energy transformer, viz., the "living cell, it is capable of being formed from and converted into "these other forms of energy, the law of conservation of energy being "obeyed in the process just as it would be if an exchange were to take "place between heat and chemical energy, or motion and electrical "energy."

Whether we range ourselves with one school of thought, or the other, the phenomena of cell action must be studied in the same way as we study the known forms of energy; this is by transforming one form to another, such as electricity to magnetism, chemical energy to heat, and observing the phenomena that accompany the transformation. To change one form of energy into another requires the action of some energy transformer. We know how the dynamo transforms motion into electricity, the steam engine heat into motion, the metal iron, for some special reason, is an excellent energy transformer of electricity into magnetic energy or mechanical motion, or *vice versa*. So

also chlorophyll in the leaf of the plant is an energy transformer, converting light energy into chemical energy. Similarly the enzymes of ferments in the living cells are specialized and strictly limited energy transformers for the transformation of chemical energy. These enzymes act by bringing about chemical changes and transformations, but, like the dynamo, which converts motion into electricity, it remains after the conversion in the same condition as before it. Similarly, a piece of platinized asbestos will ignite a stream of coal gas by bringing about rapid oxidation owing to its presence only, the platinized asbestos itself remaining unchanged. Platinized asbestos is a type of the great group of substances called Catalysors, or Catalytic agents.

As long ago as 1836, Berzelius advanced the suggestion that chemical action in living matter was aided by some such bodies as those which brought about catalytic action in the chemical reactions of the laboratory. The value of this suggestion of the great chemist of Stockholm, as is so often the case, remained unrecognized for nearly three-quarters of a century. Biological chemistry, as founded by Justus Liebig and his school, occupied itself in the study of the various constituents of the fluids and tissues of the body, the products of cell activity, and the isolation of an enormous number of crystalline chemical individuals. This material, so laboriously collected and studied and the methods devised for the isolation of these bodies has led to the synthesis of numerous highly complex and important constituents of plants and animals. The restatement, however, of the similarity of enzymes and catalytic action by physical chemists some years ago marked the beginning of a great advance in biochemistry, as it attracted to it the attention of some of the most exact chemists of the present time. The hypothesis that catalytic action in the laboratory and enzyme action which results in oxidation and hydrolysis in living tissues are identical, has incited physical chemists on the one hand to make a thorough investigation of all the phenomena connected with catalysis and the action of colloid bodies, and it has given on the other hand, a scientific working hypothesis regarding enzyme action to the students of biochemistry. That the vital processes of the body, both in health and disease, are largely dependent upon the presence of enzymes, becomes more and more apparent as these processes are more thoroughly studied and that this action is catalytic in character explains how such extensive oxidation of carbon and hydrogen in the processes of respiration, and such extensive chemical changes as those which occur in digestion and assimilation, can be carried on in the bodies of animals so rapidly and at so low a temperature. There is, however, a marked distinction

between the chemical reactions in living tissues and those which we perform in the beaker and test-tube, and it is this, that living tissues manufacture in some unknown way their own catalyzors. Apart from this, one can find in their presence in living tissues no specific difference between the chemistry of living and inanimate matter.

Bredig and his pupils a few years ago at Leipzig and Heidelberg, found a method of preparing gold, silver, platinum and certain other metals in such a finely divided state suspended in water that these substances became known as colloid metals, from their similarity to solutions of animal and inorganic colloids. The metallic particles in these mixtures were so fine as to be far beyond the range of the ordinary microscope, and only recently have they been detected by the use of the ultra microscope, whose powers of amplification are so great that it is able to detect a particle only 1-500th of the smallest particle which can be recognized by the highest power of the ordinary microscope. The behaviour of these colloid metals is so similar to that of the ordinary enzymes, that they have received the name of the Inorganic Ferments. They are not only powerful catalyzors, but, like the living enzymes, they are extremely sensitive to the action of heat and poisons. A very minute quantity of such a poison as hydrocyanic acid is found to be as fatal to the action of the inorganic as it is to that of the organic ferment. While one cannot help questioning the right to call colloid gold, silver, etc., inorganic ferments, and speak of poisoning them, yet the effects obtained through their agency has thrown a flood of light upon the manner in which a colloid can act as a catalyzor in solution.

The great Leipzig chemist and pysicist, Ostwald, has made many valuable contributions to our knowledge of the action of colloids and catalytic agents generally, and by him it was first pointed out that catalytic agents do not initiate but only tend to accelerate chemical action. We find this is also true of enzyme action. Processes of hydrolysis and oxidation which occur with such regularity and rapidity in the presence of enzymes also occur in an irregular extremely slow manner when the enzyme is absent, and the reaction rarely proceeds to completion.

One of the fundamental principles recognized in connection with chemical reaction is that principle which is termed the Influence of Mass, that is to say, that the relative mass of substances entering into a chemical reaction influence the proportion of the various products of that reaction. Reactions may cease before all the substances on the one side are converted into substances on the other side, as we would represent it in a chemical equation; and the whole system comes into

what is known as a state of chemical equilibrium. The original reaction, indeed, may be completely reversed by changes in the physical condition or the mass of the reacting bodies. Now, if enzyme action is identical with chemical reaction under the influence of catalysis, it follows that we should expect to find that enzymes were capable of bringing about reversible chemical reactions. Such is the case.

A few years ago, Arthur Croft Hill, an English physiological chemist, completely altered the views of physiologists regarding tissue metabolism by showing that the same enzyme maltase which converts maltose to glucose in dilute solution, also aids in the reversed reaction, viz., the conversion of glucose to maltose, when the solution contains 40 per cent. of glucose. The enzyme which saponifies fats and ethereal salts called lipase, by breaking them up into glycerine and fat acids, also accelerates the union of fatty acids and alcohols to form ethereal salts. The saponification of these ethereal salts by the enzyme lipase has been studied quantitatively, and it has been demonstrated that these reactions follow the mass law of chemical reactions as regularly as if their saponification were carried out in the laboratory through the influence of strong alkalies or acids. Such a reversing action has not been demonstrated for other enzymes although it is possible they may have the same power. If this prove to be the case, and this capacity of bringing about reversed reactions is one common to many or most enzymes their obvious function in the cells will be enormously extended.

Let us take for example, a proteolytic enzyme, it would not only aid, as we know it does, the breaking down of the molecules of proteids, but also become an agent for synthesizing proteids from peptones and building up the cells, absorbing energy and assisting in maintaining the chemical equilibrium between the cell contents and its surroundings.

A very interesting development in connection with the chemistry of enzymes, is the relation of the form of the molecules, that is the arrangement of the atoms in the molecule, to enzyme action. This relation of the structure of the molecule to its biological action, was thought by Pasteur many years ago to be capable of throwing much light on the nature of fermentative changes, and generally on the nature of life itself. Emile Fischer in his classical researches on the sugars, showed some years ago that the relations between the configuration of the molecule and its fermentability by yeast could be demonstrated by graphic formula. He found that only sugars containing three or six carbon atoms are capable of alcoholic fermentation, and of the possible hexoses, that is, sugars with six carbon atoms, only three are fermentable. Fischer graphically describes his results by saying that:

"Only if the enzyme and the fermentable substance have a similar "geometrical shape can two molecules approach each other near enough "for the production of a chemical reaction. Metaphorically, we may "say that enzyme and glucoside must fit into each other like lock and "key."

To summarize, we find, then, that chemical action in the living cell is transformed and assisted by the action of bodies behaving like enzymes or ferments. These enzymes act either alone, physiologically distinct, or in groups, accelerating decomposition and, perhaps, synthesis. We have found that in turn the enzymes perform their functions in a manner identical, so far as investigation has gone, with the action of the so-called catalytic agents in the laboratory, and that the changes accelerated by them are of a purely chemical character, the only obvious difference being, that the cell prepares in some unknown way its own catalyzor.

We are now brought face to face with the more fundamental question as to how catalytic agents assist in bringing about chemical change. This question is one which cannot, perhaps, be as yet completely answered. There are few problems in physical chemistry more interesting or more complex than some of the phases of catalytic action. No one theory has yet been put forwards to explain all forms of catalytic action. It is recognized in one case that catalysis is due to one cause of factor, and in another case to a wholly different one. There are several theories which are by no means incompatible.

One of the earliest explanations was that advanced by Liebig and subsequently revived under another form by Nageli, namely that catalytic agents aided chemical action by a peculiar molecular vibration which induced vibration in the molecules of other substances, thus destroying the stability of these molecules and increasing the velocity of chemical action. We are quite familiar with similar phenomena in chemistry and in physics, *e.g.*, one vibrating tuning fork induces vibration in another which produces the same note; chemical action can be accelerated by mechanical vibration or friction; chemical combination with explosive effect is induced by the shock of detonators, etc. This theory is treated by physical chemists of to-day with scant courtesy; still molecular kinetics may afford an explanation of a certain number of forms of catalysis.

Many catalyzors act by forming unstable intermediate compounds which break down leaving the agent itself unchanged to again form an unstable body from another molecule and so on. To this group

belongs a great many of the enzymes and chemical catalyzors. There are, however, others which, so far as we know, have a purely physical effect. These tend to bring about combination by a process of condensation or solution upon the surface or in the interior of the particles. In this way act platinum black, the colloid metals, hot porous bricks, etc. Catalysis of this sort is characteristic of colloid bodies generally the "solution aggrigates" which are present in solutions as ultra-microscopical particles.

The mode of action of colloid bodies has in recent years been most prominently put forward and the chemical kinetics of the reactions under such conditions has been the subject of numerous papers by German physical chemists, chiefly in the laboratories of Bodenstein and Bredig. Measurements of the rate of reactions of such heterogeneous systems are excessively complex, involving the application of the most advanced principles of mathematics and requiring years of patient investigation. The problem of how various concentrations of the colloid mixtures alter the relationships of, and attractions between solvent and colloid and so alter reaction velocities have a most important bearing on chemical action in protoplasm. Problems such as these are engaging the attention to-day of many of the advanced physical chemists of Europe.

This form of catalysis is, strictly speaking, only one of the manifestations of Surface Energy, of which the surface tension of liquids, capillary attraction, the condensation and absorption of gases by charcoal are familiar examples. Problems involving phases of surface energy have been found extremely difficult, so difficult, indeed that few but the giants among physicists have seriously attempted their solution. Nevertheless, the physical studies of some of the phenomena of surface energy, as manifested in emulsions of liquids in liquids such as milk and fats in alcohol and water, and those emulsions of gases in liquids called froth and foam, have thrown very considerable light upon the development of the cell wall. In mixtures of liquids of different viscosity such as albumens and water, Ramsden, about a year ago showed how masses of protoplasm must form solid films on their own surface, from purely physical data, and the results of experimental measurements.

As pointed out by Loeb in his recent treatise on the dynamics of living matter, the most natural and rational of the purely physical explanations of protoplasmic motion, muscular contraction and work, is that this movement is a phase of surface energy. We are familiar with the particles of camphor spinning upon the surface of water from

changes in surface tension, and how a drop of oil almost instantly covers the surface of water upon which it is dropped. Now, the movements of an amœba can be imitated by the variation in surface tension brought about by a drop of olive oil slightly acid with fat acid on a dilute solution of sodium carbonate. Amœboid movements of protoplasm can be accounted for similarly by variations in the surface tension of different portions of the living mass. This may be brought about by differences in concentration caused by solution, oxidation, absorption of surface membrane, etc. Such a theory, of course, affords no complete explanation of muscular energy, but one cannot help thinking that this phase of surface energy plays no small part in the physical manifestations of life.

I have dwelt thus somewhat at length upon enzyme action, not only on account of its importance, its general applicability, and its relations to infection and immunity, but largely that I might illustrate the general trend of research in medicine to-day. The most striking characteristic of investigations in medicine of the twentieth century, as compared with those of the nineteenth, is the more complete development of the scientific method. Medicine in her advances now seeks guidance by the finger of science, and is rapidly becoming emancipated from the rule of thumb. We hear to-day much less of that much abused word "practical," and, as a consequence, there is more search for those truths which lie at the very roots of the bedside problems, even though the practical application seems remote or even impossible.

In the great centres of medical research and instruction, both in Europe and America, bio-chemistry, physiology and pathology are receiving more and more attention. These sciences are so extended in their scope that they embrace mathematics, physics, chemistry and biology on the one hand, and clinical work on the other. In Germany we find the new hospitals provided with bio-chemical laboratories, living laboratories, not only costly piles of bricks and mortar, but working entities. Problems come to the laboratories gathered at the bedside in the hospitals and the methods of the laboratory are becoming more and more those of the clinician. The wide gap which formerly existed between the laboratory and the ward worker is now in all centres of earnest work completely bridged over. The co-operation and co-ordination of the laboratory and the clinic alone leads to the higher and permanent type of work. Investigations in medical laboratories are largely based upon bio-chemistry, which seems to have taken up the thread of medical research where it has been lost to the highest powers of the microscope.

The goal of chemistry as an experimental science is to offer a complete interpretation of the constitution of everything animate and inanimate; but the goal is an ideal one. It marks the direction in which we travel, but never the spot we shall ever actually attain. For, as the late Kingdon Clifford says, "Scientific thought is not an accompaniment or condition of human progress, but human progress itself."

A CASE OF BLENNORRHŒA NEONATORUM FROM THE BACILLUS COLI COMMUNIS.

BY

S. HANFORD MCKEE, B.A., M.D.

Some weeks ago I was called to see an infant suffering with a severe purulent conjunctivitis of the right eye.

The child was four days old, and the history was that the eye had become inflamed and began discharging the day before.

The clinical picture was—severe swelling of the lids, with profuse purulent discharge, œdema of the bulbar conjunctiva, blennorrhœa neonatorum. The cornea was intact. The left eye was not involved, so was immediately protected. Smears were made and media inoculated. The stained side showed a few Gram positive bacilli — the xerosis — and numerous Gram negative bacilli which looked like the colon bacillus. The gonococcus was not present.

The treatment ordered was irrigations of the conjunctival sac every half hour with warm boracic solution.

The discharge gradually ceased, and on the fifth day the eye was quite well.

The media inoculated gave growths of the bacillus coli communis with a few colonies of the xerosis bacillus.

The case is of interest, inasmuch as the infection was caused by the bacillus coli communis, but gave the clinical picture of the blennorrhœa set up by the gonococcus.

Axenfeld reported a case in 1896, and later Bult. They both emphasize the fact that blennorrhœa from the colon bacillus runs a much milder course than blennorrhœa caused by the gonococcus.

We extend our hearty congratulations to Professor T. G. Roddick, Dean of the Faculty of Medicine, upon the occasion of his marriage to Miss Redpath of Montreal, at Chiselhurst, England.

THE

Montreal Medical Journal.

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

Remittances advertisements or business communications are to be addressed to the Montreal Medical Journal Co., Box 273 ; all others to the Managing Editor, 216 Peel Street, Montreal. All communications intended for insertion in this Journal are received with the understanding that they are contributed exclusively to this Journal. A limited number of reprints of articles will be furnished to authors at cost price, if a request to that effect accompany the manuscript.

VOL. XXXV. OCTOBER, 1906. No. 10

THE ADDRESS IN MEDICINE.

The address in medicine before the British Medical Association was delivered this year by Sir James Barr, the well known senior physician of the Liverpool Royal Infirmary.

He chose as his subject "The Circulation viewed from the Periphery." He pointed out at the beginning of his discourse how many diseases of the heart originate in causes having their seat at the periphery. He claims that until recently the peripheral circulation has been left largely to the physiologist and pathologist, and that the clinician who would advance in knowledge must pay increasing attention to their teachings. "The man," he says, "who only studies the circulation with the aid of a stethoscope is a positive danger to society."

The average reader feels quite at ease in following the lecturer when he speaks of such peripheral symptoms as cyanosis, pallor and cold extremities; but the greater part of the lecture deals with much

more abstruse subjects. The lecturer considers in order the capillaries, veins and arteries, and describes methods of estimating the lateral pressure and blood velocity in each kind of vessel, and at all parts of the body surface. He also discusses the viscosity of the blood, and points out how it varies as the result of many modifying influences, being diminished by fever and increased by carbonic acid gas, diminished by salts of potassium, sodium and ammonium, and increased by those of calcium, magnesium and strontium. It also varies, he tells us, with the number of corpuscles, and under the influence of certain internal secretions like that of the thyroid gland.

He expresses himself rather strongly on the question of lymph formation. He is a strong supporter of the so-called mechanical school, and with them explains all by filtration, osmosis and varying intra-capillary pressure. He is guilty of an apparent inconsistency in this connexion, for on one page he supports Runeberg's view that a colloid filtrate is most concentrated at low pressures, and on the next page he partly explains the deficiency of proteids in the cerebro-spinal fluid by the low pressure in the cerebral capillaries.

He describes the structure and nervous connexions of the vessels in all the important areas of the body, such as brain, lungs, heart, liver and kidneys, and brings together a vast amount of material bearing on these points.

The chief novelty in his lecture, however, is the way in which he attempts to estimate the velocity of the blood flow in the capillaries and veins, and also the pressure exerted by the blood on the walls of these vessels. On some of these points we are constrained to feel that, like some of Browning's heroes, his art gives way, his reach exceeds his grasp.

For instance, he tells us that the velocity in the capillaries is thirty or forty times what it has been estimated at by the most careful physiologists, and we must confess that the methods by which he has reached this remarkable conclusion impress the ordinary reader as very uncertain. He estimates the rate of flow in the capillaries by compressing all the blood out of a small area and observing how long it takes to return. He fails to realize that he is introducing most abnormal conditions. While the compression is applied the capillaries are empty and the pressure within them, when it is removed, is practically nil. The blood is then allowed to flow into them from both ends at once, from both arteries and veins. We cannot believe that Sir James will long continue to base any arguments on such a fallacious method as this.

His arrangement for estimating the velocity in the veins is very similar and will not, we think, be generally employed. We also fail to grasp some of his statements with regard to intravascular pressure. He tells us that the pressure in the veins may be greater than that in the capillaries without interfering with the onward flow of blood, and also that during the systole of the ventricle there is very little lateral pressure exerted upon the walls of the aorta. If such were the case we cannot see how the aorta would become distended as it certainly does.

We mention these points simply to indicate that this very erudite and deep discourse must be perused very carefully, as the way is beset with pitfalls for the unwary.

At the same time Sir James Barr has done us all a most valuable service in pointing out the absurdity of thinking that we have examined the circulatory system when we have merely percussed the heart and listened to its sounds with a stethoscope. On the contrary, a careful examination of the arteries, capillaries and veins can often throw most valuable light on the conditions present.

As Sir William Broadbent remarked at one of the meetings of the medical section, we must not unduly elaborate our technique, but we hope that as attention becomes more directed to the periphery, some simple yet efficient means may be evolved for obtaining the necessary data. There is certainly a wide field open here to him who "through long labours hunteth after fame."

STERILIZATION OF DEGENERATES.

At the Toronto meeting of the British Medical Association, Dr. Rentoul of Liverpool returned to his propagandism of the practice of eunuchry. Dr. Rentoul's appeal to the facts is irresistible. By the British census returns for 1901 it appears that there were 60,721 idiots, imbeciles and feeble-minded; and of these 18,900 were enjoying the blessings of matrimony. The same census showed that there were 117,274 lunatics, of whom 46,800 had been married. This evidence is quite strong enough without appealing to the authority of Dr. "Lydson" of Chicago.

Dr. Rentoul, it appears, is meeting with opposition in his propaganda, and he informs us that no less than ten firms had refused to publish his monograph. We would comfort him by the experience of St. Paul. That great reformer also complains that he had encountered persecution for his teaching in connexion with another operation upon those

parts; and, though not precisely a humourist, he permits himself to employ a rough jest against the advocates of circumcision: "I would they were completely cut off which trouble you"—that, we believe, to be the full significance of the term in the original Greek, if Messrs. Liddel and Scott inform us correctly.

We had always regarded the sterilization of an individual as a considerable surgical procedure; but it appears from Dr. Rentoul's account that the operation is so trivial as to be almost cosmetic in its simplicity.

If the method become a well established usage in the profession, its benefits may be sought by those who are not entitled to the immunity which it confers, just as applicants are continually applying to the Society for the Prevention of Cruelty to Animals for the courtesy of their lethal chamber. Surgeons have troubles enough refusing permits to enter hospitals, certificates of disability, orders to purchase intoxicants, without being obliged to offend their patients by declining to render them the slight office of performing a vasectomy.

What with the incapacity or disinclination of more intellectual persons to propagate their species, if the more weak-minded are deprived of that duty, the end of the race is in sight, and we may look for the coming of those events described in "The Last Man" by the poet Campbell. Certainly Cowper would surely not have escaped the knife had the practice of vasectomy been in vogue in his day. There is no evil without its remedy, and if the melancholy poet were face to face with such a contingency, he could plead "eye-strain" and appeal to Dr. Gould.

There be eunuchs, we read, which have made themselves eunuchs for the kingdom of heaven's sake. Let Dr. Rentoul be encouraged in the practice for the sake of the human race if thereby it can be improved.

MEDICAL INSPECTION OF SCHOOLS.

The first attempt at the medical inspection of schools in Montreal, which was made a year ago, ended in fiasco. A second attempt will be made at the beginning of this month. At the present moment 41 physicians have signified their acceptance of the positions of inspectors. There are in the schools 53,000 pupils, a number which will give to each inspector the supervision of 1,300 cases in 72 schools. The remuneration amounts to sixty cents a day for each physician, which does not seem to be excessive for so considerable an undertaking; yet

it is an advance upon the previous rate, which was thirty cents an hour, a wage which we remarked at the time was appreciably less than the emolument of a cab-driver.

The specific terms of the engagement which govern the physicians are not available, and we cannot say whether the work is one of charity or of fair recompense for services rendered. If this is a charitable scheme we think that parents should be informed of the fact, as there are yet some persons who have an aversion to accepting charitable assistance.

The hospitals are doing a great work in educating the public into the belief that the profession exists solely for its gratuitous aid, and this new experiment will be a further demonstration of the veracity of that supposition. No man lives for himself. We can only hope that this new expression of our willingness to serve will hasten the day when the parents of these children—many of whom are trustworthy plumbers and excellent grocers—will adopt so noble an attitude, and minister to our necessities with the single aim of doing good.

In common with other good citizens, we desire to be sharers in the high privilege of paying for public education, and certain documents which come to hand on the first day of November will remind us of our prerogative. We do not, as a profession, object to bearing this new burden of medical inspection alone, but merely express our willingness to share it with other members of the community.

THE TELEPHONE.

A judge of a Massachusetts court, in ruling upon a case of alleged misdemeanour which a husband brought against his wife for persistently calling him by telephone, delivered this *obiter dicta*:—"I think that one having a telephone in his house could enjoin a person from continuously ringing him up day and night upon unimportant matters which he had no right to do, to the loss of sleep and rest to the occupant and to his great annoyance."

A physician who had returned from his holiday was obliged to spend a day in his house setting his correspondence in order, and conceived the happy idea of tabulating his telephone calls. He has favoured us with a copy of the schedule, which is too complicated and exhaustive to be reproduced *in extenso*, but a few extracts will be instructive in showing the degradation to which the useful service of telephony has fallen.

The period of time covered by these observations was from eight in the morning till eight at night. The total calls numbered 37, being a fraction over three per hour. Under the heading "wrong number" there are three entries; "never mind, I will call you again," there are two; "one minute, please: Mr. Blank wishes to speak to you," there are six; "how long will you be in," there are five; "cook," one; "furnace-man," one; "housemaid," two; "tradesmen," two; "miscellaneous," two. This makes 22 calls, leaving a balance of 15, the origin of which is not specified, but, presumably, they have to do with the practice of medicine.

Analysis of these statistics yields some interesting results; but the heading "how long will you be in" includes cases of the worst abuse. This is a device which persons employ, whose opening formula, when they call, is: "I do not wish to consult you professionally."

It is only in a moment of petulance that a man would deprive himself of the benefits inherent in the telephone service. But that service has the defects of its excellence. If there be but one instrument in the house, and that one on the desk, the physician is at the mercy of every individual within a radius of a hundred miles who chooses to call him. It does not tend to composure when an examination is in progress to have the telephone bell roaring; nor does it make a patient more amiable, to be interrupted in his relation by a conversation carried on between the physician and an unseen person, whose tenor, no matter how well concealed, may have to do with a game of golf or some other subject equally foreign to the patient's immediate concern.

It is quite true that one may have a private telephone, the number of which may be given to those who are entitled to it. The name may or may not appear in the book. That was the practice which the late Dr. Craik employed at one time, but it is open to the disadvantage that persons having legitimate business are unable to avail themselves of the service.

A better way, it appears to us, would be to arrange a system by which a telephone might be available to the public during certain hours of the day, and private the remainder of the time. Such an arrangement would not inconvenience regular patients who would have access to their physicians at all times. Other persons having legitimate business to transact could easily call during the specified hours, and the physician would be spared those wanton inroads upon his time which make consecutive work impossible.

A year ago we had occasion to mention with commendation the conferring upon Dr. Shepherd by the University of Edinburgh of the degree of

Doctor of Laws. Again it is our privilege to felicitate the Professor of Anatomy upon the excellent company in which he found himself at the opening of the Harvard Medical buildings, where he was honoured with the same degree along with Charles A Coolidge, Boston; Dr. Simon Flexner, Rockefeller Institute for Medical Research, New York; Dr. John Collins Warren, Harvard Medical School; Dr. H. P. Bowdith, Harvard Medical School; Dr. Don Jose Ramos, Institutio Medico Nacional, Mexico; Dr. Franz Keibel, University of Freiburg, Germany; Dr. Charles S. Sherrington, University of Liverpool, England; Sir Thomas Barlow, University of London; Dr. Abraham Jacobi, emeritus professor College of Physicians and Surgeons, New York.

THE FIVE YEARS' COURSE.

The Calendar of the Medical Faculty of McGill University for the session of 1906-07 contains an inset printed in red which is significant. The notice reads: "It is proposed by the University to establish a *Five Years' Course* for the Degree of Doctor of Medicine and Master of Surgery, beginning in the Autumn of 1907. Further notice with full details will appear in the Calendar of 1907-08."

At the last meeting of the College of Physicians and Surgeons, held on the 26th of September, a resolution was adopted that the by-laws of the College be altered so that a five years' course could be exacted from all candidates for provincial registration. If the Legislature confirms this resolution, the five years' course will become a legal necessity as well as a University regulation.

In so far as patients suffering from erysipelas are concerned, Montreal is yet without a hospital for contagious diseases. This is in face of the fact that two new hospitals for that specific purpose have been opened within the year at a cost of half a million dollars. In time accommodation will doubtless be provided; but at the moment the plea is that the governors of the Alexandra Hospital are without funds to provide an isolation ward for cases of this kind. The public subscribed handsomely, and will not willingly listen to new demands. In the meantime the governors might be reminded of the justness of the maxim that one should cut his coat with some reference to his available material.

We regret that through inadvertence and from no intent to forestall a contemporary journal to which we are indebted for not a few favours

in the past, the article by Dr. Adami upon the Dominance of the Nucleus was published in our last month's issue in advance of its publication in the columns of the *British Medical Journal*. Even if we do not entirely agree with the wisdom of a rule, we desire to conform to it whilst it is in force.

The profession of medicine in Prince Edward Island has lost its leader in Dr. F. P. Taylor, who died at Charlottetown on the 17th of September, 1906. Dr. Taylor had practised in Charlottetown since the year 1879, and won for himself the regard and affection of the profession and of the public. He was an accomplished physician and a skilful surgeon. He was well known also to the profession in Montreal, where he was in the habit of making frequent visits.

In the account of the proceedings before the Pathological section of the British Medical Association at Toronto published in this number the following paragraph should have been inserted:—Professor J. J. MacKenzie, of Toronto, gave a lantern demonstration of the changes produced in large arteries by his pupil Harvey as a result of painting the outer coats of the artery with a silver nitrate solution. In one case they had obtained definite bone formation in the adventitia.

The experiment of conducting a hospital without a medical superintendent has proven a failure at the Kingston General Hospital, and the governors have decided to return to the former system. The plan of having a lady superintendent and a medical board did not work with any degree of satisfaction.

Dr. John L. Todd, a graduate of McGill, who is well known for his researches on Sleeping Sickness in the Congo States, has had the Order of Leopold conferred upon him by the King of Belgium.

RECIPROCITY WITH GREAT BRITAIN.

At the last meeting of the College of Physicians and Surgeons of the Province of Quebec the first step towards reciprocity with Great Britain, in the matter of medical degrees, was formally made.

It appears that, during the July meeting, a letter was read from Donald Macalister, President of the General Medical Council of Great Britain, which had been addressed to a private individual having no official connection with the College.

As this letter appears to have brought the discussion to a head we think it worth while to print it as it was read:—

"I agree with you entirely that reciprocity with Great Britain and interprovincial reciprocity are entirely separate questions, and should be dealt with separately. The former under the new law can be dealt with at once, without waiting for any reconstruction of the Medical Administration of Quebec.

"The one thing essential for a successful application to the King in council, is — that Quebec is prepared to allow duly qualified British practitioners to register and to practise in Quebec without further examination. In other words, that possession of a registered British Diploma shall admit to the Quebec register in the same way as if the holder had a degree from McGill or Laval. If this assurance is conveyed to the Privy Council by the "Provincial Government," along with their application to have the British Medical Act, Part II, 1886, applied to the Province, I am prepared to advise the Privy Council that the application should be granted.

"There is no need to wait for a Central Examining Board, there is none such in the Australian States, or Italy, or India, which already enjoy reciprocity.

"Supposing the Privy Council grant the application, the next step lies with the General Medical Council. It has to decide what Quebec diplomas shall admit to the British Register. In accordance with precedent it will probably decide that any medical degrees granted in the Province which are registrable in the Provincial Register shall be registrable here. In no case hitherto, where a country or province (*e.g.*, New South Wales or India) has been admitted to reciprocity, has the Council discriminated between the several local universities, and accepted some while it refused others. But it is of course just possible that the Council might refuse to recognize a four years' course — though if that is the rule throughout the Province, and there is no higher standard available, the result would be to render the reciprocity granted by the King in Council a nullity. Such a result would not, I think, be contemplated for a moment by the Council; and if it were, the Privy Council has power to prevent such a fiasco, and could, without more ado, order the Medical Council to register Quebec Degrees. In my opinion, this is the course that would be taken, and justifiably so; and the knowledge of its possibility and probability which the Medical Council possesses should remove any hesitation on your part as to whether the Council would act reasonably or not. It appears to me that the fact that the Quebec College of Physicians is primarily a

registering and supervising body, and not an Examining Body, makes the procedure simpler and easier because it is on the lines of all existing precedents. For this reason I should much prefer that Quebec should be the first Province to apply. The Examining Board provinces would raise other question of a novel kind, for which our past experience would be less useful."

Coupled with this the two following resolutions were offered in the form of notice of motion:—

"That the College of Physicians and Surgeons of the Province of Quebec beg the Legislature of the Province of Quebec at its coming meeting to send a request to His Majesty's Privy Council demanding the application of the Medical Act of 1886 and the amendments of 1905 to the Province of Quebec."

"That upon a favourable answer from the Privy Council, the College of Physicians and Surgeons of the Province of Quebec enter upon the necessary negotiations with the General Medical Council of Great Britain, in order to assure the establishment of reciprocity between Great Britain and the Province of Quebec."

At the meeting held on 26th September the former of these two resolutions was adopted; and to the latter a proviso was added, and the whole agreed to with only one dissenting voice. This clause as accepted reads:—"Pourvu que ceux qui, ayant obtenu la licence britannique, demanderaient la licence du Collège de la Province de Québec, auront au préalable de leur enregistrement britanniques satisfait à toutes les exigences de notre loi médicale pour l'obtention de notre licence."

Of that clause we offer this as a translation:—"Provided that those who, having obtained the British Licence and are demanding the License of the College of the Province of Quebec, shall prior to their British Registration have fulfilled all the requirements of our Medical Act in regard to the obtaining of our license.

This proviso was proposed by the President, Dr. Lachapelle, with the explanation that it was intended to prevent "irregulars" in the Province from going over to Great Britain and coming back with a British Registration, which would compel the College to give them the Quebec License nothwithstanding their irregularity.

With this proviso coupled with the explanation of the President we have no fault to find. When the matter comes to be dealt with at close quarters it will doubtless be made clear that the object is to prevent deliberate evasion of the regulations of the College—not to nullify the value of reciprocity. It now remains for the Legislature to give effect to these resolutions by the necessary enactments which

will bring to an end a controversy which has troubled the profession for many years.

Reviews and Notices of Books.

A Non-Surgical Treatise on Diseases of the Prostate Gland and Adnexa. By Geo. W. Overall, A.B., M.D. Chicago: Rowe Publ. Co., 1906.

The reviewer, having lost a certain amount of time in reading this book, finds himself at the end willing enough to express his opinion of it. It is, as a matter of fact, a most entertaining book when looked at from the standpoint of style and spelling; and will be read with pleasure by those whose studies have tended more towards electricity than pathology. The book ought, really, to have been published in serial form in *The Medical Brief*, or *The Alkaloidal Clinic*. There the author might have found more numerous and more appreciative readers; at any rate, might have found many to enjoy the colloquial case-report so characteristic of those journals. We may be pardoned for quoting in part one of the gems of the collection. "I recall one case who said the first time he had his attention called to any defect in his left foot was by his wife, when walking upon the street, when she said: "Will! for goodness sake, quit scraping your foot on the pavement.'" It turned out that the gentleman in question had developed a left hemiparesis. Dr. Overall lost some time at first in treating his spine with electricity; but, fortunately, soon got upon the right track, treated his prostate with various forms of "electrical force," and cured him.

The mention of this matter brings us to the question of treatment. Here the reviewer must refrain from judging, and confess ignorance. We know, personally, nothing of the sinusoidal current in the treatment of "Neuroses of the Prostate." We hardly even knew that the prostate might be neurotic. We know nothing, or practically nothing, of the treatment of hypertrophied prostate by the "use of cataphoresis with one per cent. solution of thuja through the prostatic urethra." We did think we knew something of tuberculosis of the prostate, but Dr. Overall informs us that the thing does not exist; in fact, that it is a mere diagnostic city of refuse for those who have failed to treat successfully "chronic prostatitis." Our ignorance, it appears, has been both positive and negative, if the kind reader will take our meaning.

Electrolysis, cataphoresis or electric osmosis, high frequency and high potential currents in the treatment of prostatic diseases, solenoids, resonators, detonators, the sinusoidal current,—these are the play-words, so to speak, of our author; and they may very possibly represent valuable forms of treatment when applied by means of the fifteen or sixteen odd instruments which he has devised. We simply do not know. Only we hope that his electricity is better than his pathology.

E. A.

THE EXTRA PHARMACOPEIA OF MARTINDALE AND WESTCOTT. Revised by W. HARRISON MARTINDALE Ph.D., F.C.S., and W. WYNN WESTCOTT, M.B., Lond., D.P.H. Twelfth Edition. London: H. K. Lewis, 136 Gower Street, W.C., 1906. 1075 pp., 24 mo. 10 shillings net.

The eleventh edition appeared, if we mistake not, two years ago, and the present volume contains many valuable additions, so that, in fact, there are over two hundred additional pages. The book, a volume of 5½ by 3½ inches, contains an amount of information that is surprisingly great, which is not by any means restricted to purely pharmacological data, but contains therapeutic knowledge in the very widest sense of the word. For example, the preparations of the different animal organs, and of antitoxins with small text references in regard of their use from the literature of the present year, are given. A part of the book is devoted to analytical memoranda, containing most useful information on the composition and use of various stains, and biochemical reactions; bacteriological examinations are dealt with in a way that appears to be brief but eminently practical. These are but some of the addenda to the previous edition, which is so well known as to require no special mention. The book is a wonderful aggregation of useful information in the smallest possible space, and we anticipate much profit from keeping it at hand for reference; it can be enthusiastically recommended.

LECTURES ON MIDWIFERY FOR MIDWIVES. By A. B. CALDER, M.B., M.R.C.S., Lecturer on Midwifery to the London County Council, etc., etc. London: Ballière, Tindall and Cox; Toronto: J. A. Carveth & Co. $1.50.

The book is composed of fifteen chapters, each containing the substance of a lecture. The first ten deal with the normal anatomy, physiology, and the hygiene of pregnancy; the mechanism and phen-

omena of labour; and the management of labour and the puerperium, including breast and bottle feeding. Three further chapters are concerned with abnormal anatomy, abnormal labour and puerperium, and the abnormal child, while special chapters were devoted to sepsis and asepsis and to sanitation, under which is included the consideration of certain features of the Midwives Act.

In the definition of "presentation," "presenting part," etc., there is some excusable confusion which is remedied a little further on, and we confess surprise at the repetition of "*obdurator* foramen" and "*vilamentous*" insertion of the cord.

The chapter on sepsis and asepsis is particularly good and embodies all accepted facts without unnecessary dogma. After detailing the strongest arguments for and against vaginal douching, the responsibility of decision is left with the attending physician, and the nurse or midwife is advised to obey his instructions rather than her own inclination.

Medical News.

McGILL UNIVERSITY.

Official figures of the attendance at McGill, up to the close of the month of September, show that in the four faculties of Arts, Applied Science, Medicine and Law, the number of students enrolled is 1,207 as compared with 1175 last year.

The following comparative statement shows the attendance in the Faculty of Medicine during both years:—

	1905	1906
Fourth year	97	81
Fourth year	76	94
Second year	99	91
Third year	76	94
Partials	7	4
Total	353	363

ROYAL VICTORIA HOSPITAL.

Monthly report for September:—Patients admitted, 242; patients discharged, 243; patients died, 13. Medical, 84; surgical, 101; ophthalmological, 7; gynæcological, 28; laryngological, 22. Out-Door Department—medical, 826; surgical, 707; ophthalmological, 389;

gynæcological, 131; laryngological, 457; total, 2,510. Ambulance calls, 96.

Returns received at the Board of Health Office of Ontario, for August, from 745 division registrars, representing a population of 2,091,183, give a total of 2,570 deaths from all causes, which is at the rate of 14.2 per 1,000. For the same month of last year 2,200 deaths were reported in a population of 100,000 less. Contagious diseases show ten cases and no deaths from small-pox; 45 cases of scarlet fever, and six deaths; diphtheria, 125 cases, and eight deaths, compared with 132 cases and 21 deaths in August, 1905; measles, 35 cases, and seven deaths; whooping cough, 119 cases, and 21 deaths; the figures for August, 1905, being 141, and 16 respectively; typhoid, 276 cases, and 72 deaths, compared with 256 and 43. Tuberculosis was responsible for 177 deaths, the number of cases being 180. For the corresponding period of last year there were 153 cases and 147 deaths from tuberculosis.

Advantage was taken of the presence in Montreal of Professor Charles Monod to offer him an entertainment by his confreres, in recognition of his high services to surgery in France. At the dinner which was held at the Club Lafontaine, much cordiality was displayed. The entertainment was in a degree directed also towards his son, Dr. Fernand Monod, who has secured so warm a place in the affections of the profession since his coming to Montreal. Dr. Monod, the guest of the evening, proposed the toast of Laval and McGill. For McGill, Prof. J. C. Cameron replied in a worthy speech, delivered, to the evident pleasure of the French half of the company in French. Among the English members present were Professors Gardner, Cameron, Birkett, Finley, Evans, and Drs. Hutchison, Garrow, H. D. Hamilton, Springle, England, Dorion, Gurd, Reilly, Craig, Gray and Archibald.

The composition of the new Board of Health for Ontario is as follows:—Dr. Charles Sheard, medical health officer, Toronto; Dr. Milton I. Beeman, Newburgh; Dr. John W. S. McCullough, Alliston; Dr. C. Bernard Coughlin, Peterboro; Dr. W. J. Robinson, Guelph; Dr. W. R. Hall, Chatham; Dr. C. A. Hodge. The permanent secretary will continue in that capacity with the new board. The term of the members, outside of the secretary, is three years. The old board passed out of existence on August 21 of this year, and none of its members were reappointed.

At the last meeting of the College of Physicians and Surgeons of Quebec the following medical graduates were admitted to practice:—J. J. Heagerty, Omer Camirand, Geo. Lonergan, John F. Beaulieu, Jean B. Prince, Eug. Verret, Henry Lemire, Geo. Mignault, Alf. Gaboury, Henry Cartier, Art. Lecere, Jean Bte. Piegay, O. Bellemare, Geo. Letendre, Eug. Arsenault, John David Ross, Emile Dion, Adolphe Drouin, J. Landry, Wilfrid Laroche, Geo. Fisher and J. B. Delage.

According to the Niagara Falls *Review*, tenders are being called for the proposed new hospital to be erected in East Sherbrooke. The plans are so arranged that the building can be added to. In the first instance the contract will call for an expenditure of over $100,000, but the completed buildings as called for by the plans will mean an amount approaching $300,000.

At a meeting of the American Surgical Trade Association, held in Philadelphia, in June, it was resolved that after January 1st, 1907, the trade adopt the French scale for all catheters, bougies and sounds. A committee was appointed for the purpose of preparing an accurate French scale card.

The new Mackenzie memorial wing, founded by the bequest of the late Elizabeth Mackenzie, wife of Lieut.-Col. J. F. Turnbull, has been officially inaugurated. The new wing, which is attached to the Jeffery Hale Hospital, cost $100,000.

Lieutenant-Governor Dunsmuir has offered to give $10,000 to a sanitarium for consumptives in British Columbia, provided the committees now working are successful in raising $50,000 for the building and equipment.

The Buckingham *Post*, in its issue of the 31st September, gives much praise to the new hospital which has been erected by a religious order in that town.

Ground has been broken in Edmonton for the erection of a hospital for contagious diseases. It will be erected by the authorities of the town.

The meetings of the Montreal Medico-Chirurgical Society will be resumed on October 5th by a "smoking concert."

Dr. Minerva Greenaway died at Toronto, in St. Michael's Hospital, of typhoid fever, on the 27th of September. She was a graduate of the Women's Medical College in 1899, and took first-class honours at Trinity University. She afterwards took a post-graduate course for one year at a West Philadelphia Hospital. For the past five years she has carried on a successful practice in Toronto. Dr. Greenaway was a lecturer on the diseases of children at the Women's Medical College, Secretary of the Alumnæ Association and lecturer to the nurses at the Orthopedic Hospital.

Dr. John Matthew Lefebvre died in Vancouver on the 16th September, after a short illness, at the age of 53. He was a graduate of McGill University, and chief surgeon of the Western Division of the Canadian Pacific Railway.

The death is announced of Dr. Edmund Moore at Salisbury, N.B., where he had practised for thirty-two years. He was born in Nova Scotia, and graduated from Dalhousie College in 1874.

Retrospect of Current Literature.

SURGERY.

UNDER THE CHARGE OF GEORGE E. ARMSTRONG.

EDWIN BEER, M.D. "The Therapeutic Value of Artificial Localized Hyperemia in the Treatment of Ambulatory or Dispensary Cases." *Medical Record*, August 25, 1906.

This article is based upon some one hundred and fifty cases so treated, some ninety odd of which were by suction hyperemia alone. Review is also made of the published results and a very full bibliography appended. The writer used suction hyperemia as a prophylaxis against infection in perforating wounds of the extremities in eight cases and found it very efficacious. His other cases were, twenty-six cases of infected wounds and cellulitis of fingers or hands; thirty-five of furuncle, carbuncle, and abscess; six of acute suppurative adenitis; seven of acute bursitis, and of contusions (black eyes, etc.). He has also employed suction hyperemia in more chronic cases with success. In applying these suction cups to an inflamed part, two cardinal rules must be adhered to:—First, the procedure must not cause pain; second,

the suction must be intermittent, the cup remaining in place three or four minutes is removed for one or two minutes, and the process repeated for from thirty to forty minutes. In Bier's clinic suction hyperemia has been used with success in over six hundred cases of furuncles, carbuncles, buboes, cold and acute abscesses, mastitis, infected wounds, cellulitis, phlegmons of the floor of the mouth, insect bites, panaritia, and paronychia.

In addition to the method first described, hyperemia may be produced by constriction. Constriction hyperemia is produced by applying a thin rubber (Martin) bandage proximally to the part to be treated. By this means we may produce a marked or a mild venous hyperemia, the former cannot be borne with comfort for more than an hour, the latter for the greater part of the day with perfect comfort. Swelling of the part is present in both methods, but is more marked in the latter. After removal of the bandage a reactive hyperemia, arterial in character, sets in, and is more marked after the production of a high degree of venous engorgement. These two degrees of venous congestion must be kept absolutely separate, as they have special and very different usages. The marked venous engorgement is for chronic, whereas the milder degree is useful in acute conditions. The writer used marked venous congestion in twenty-nine cases of stiffness of joints following severe old contusions, or multiple healed incisions of cellulitic areas or fractures and found that pain was almost regularly relieved and motion of the part improved. Bier has drawn attention to the beneficial effect obtained by hyperemia treatment in a group of conditions usually following trauma which present no diagnostic features and which baffle the surgeon to relieve. The writer thinks that the arterial reaction, which sets in after removal of the constricting bandage, is probably very important and cites a case in point. Six cases of joint and bone tuberculosis treated with good results. Last year Bier advocated the use of a fiery red hyperemia produced by a light application of the rubber bandage in the treatment of acute inflammatory conditions. The bandage so applied remained in place ten hours in mild cases, twenty to twenty-two in more acute. Here, as in the other forms, the rule is that it must never cause pain, and between treatment the part is elevated to allow subsidence of the œdema. This method of treatment leads to rapid separation of unhealthy and dead structures from healthy. It preserves tissues which usually necrose, *e.g.*, tendons. In some cases it causes absorption without pus formation; in others it converts hot into cold abscesses. At times it leads to pus absorption without incision. It relieves pain rapidly.

Such are a few of the main observations Bier has made in cases of cellulitis, joint infection, acute osteomyelitis, and tendon sheath phlegmon. As a result of Bier's success, and of others who have followed out his directions, our ideas of the harmfulness of congestion must be modified. We have been accustomed to regard pain as the result of hyperemia, but we now see it relieved by congestion. The explanation is to be found in the fact that pain is produced by the irritation of the peripheral nerves by concentrated exudates, and that artificial congestion dilutes these exudates and in addition acts similarly to Schleich's infiltration. The antibacterial action is accounted for by the fact that in the treated part there is an increase in alkalies and carbonic acid, both in the blood and lymph; that there is a marked local increase in the number of leucocytes, and probably an increase in the alexins (enzymes). It has also been noted that there is a marked increase in the excretion of purin bodies in cures so treated which indicates a breaking up of numberless leucocytes. It has also been found that vessels which were full of leucocytes became dilated and the cells less numerous. Besides the analgesic and the antibacterial activity of localized œdemas we have a nutritive and a resorptive influence inherent in the process. In the stimulation of the periosteum we have an example of the nutritive, while in the loosening up of old adhesions we have instances of the latter.

Robert J. Miller, Jr., M.D. "The Results of Operative Treatment of Varicose Veins of the Leg by the Methods of Trendelenburg and Schede." *Bulletin, Johns Hopkins Hosp.*, September, 1906.

Varicose veins of the leg are not an incident of senility, the condition is rather a disease of young and middle aged individuals, over one-third of the cases appearing before the 20th year, and two-thirds before the 40th year. From an ætiological standpoint there are two classes, inflammatory and non-inflammatory. The former group included about one-third of all cases, phlebitis occurring as a complication sequel of pregnancy, post-operative convalescence or an acute infection, among which typhoid fever is the most frequent. The pathology of the non-inflammatory group is obscure. In 128 cases the right and left legs are affected in about equal proportion; over one-half of the cases are bilateral. Trendelenburg's operation cured 78 per cent. in a series of 41 cases; this is about the result generally reported. In the first four post-operative years 89 per cent. were cured; in the fifth to eighth years but 63 per cent. remained cured; the tendency to recurrence increases as the post-operative period lengthens. Schede's operation

cured 33 per cent. in a series of 9 cases. The tendency to recurrence is much greater after Schede's operation. Division between ligatures of the saphenous vein does not ensure permanent occlusion. The stream may be re-established in three ways, dilatation of anostomoses around the point of division, formation of varices in the scar, end-to-end anostomosis of the ligated stumps. The Schede operation is followed particularly by anostomosis of ligated stumps; of six cases three showed an intact saphenous vein running directly through the scar. Functional restoration of the saphenous vein may be, but is not always, accompanied by recurrence of symptoms. Resection of 8 cm. or more of the saphenous vein at the saphenous opening through a generous transverse skin incision is to be preferred to simple division of the vein. Post-operative embolism is rare, but has occurred between the fourth and thirteenth days.

JOHN CHALMERS DACOSTA. "Report of a Case of Tumour of the Carotid Body." *Annals of Surgery*. September, 1906.

The case occurred in a man of 52 years of age, who, for over twenty years, had noticed a small lump on the right side of the neck. During many years it slowly increased in size and then began to grow rapidly, and had attained the size of a hen's small egg during less than a year of rapid growth. He had some difficulty in swallowing, had attacks of redness of that side of the face, and occasionally suffered from pricking pain in and around the tumour. A differential diagnosis was made excluding aneurysm, misplaced thyroid tissue, sarcoma, fatty tumour, and lymphatic glandular enlargement. The operation was a difficult and severe one, attended by considerable loss of blood. The common carotid was ligated as well as the external and internal carotids, and the tumour mass separated from surrounding tissues and removed. The internal jugular had also to be ligated, having been severely torn. Eight hours after operation he developed a weakness just short of complete paralysis of left arm and leg, the face escaping. He also had a low and hoarse voice, relaxation and œdema of left vocal cord due to injury of the superior laryngeal nerve. For some days there was a copious flow of mucus from larynx and bronchi, and, owing to the anæsthesia of the mucous membrane, he had great difficulty in expelling the mucus. On the eighth day after operation complete hemiplegia suddenly developed, and the man was dull, drowsy, and sometimes stuporous, but never unconscious. This condition was thought to be due to embolism, probably in the internal capsule, the first to thrombosis in the cortical vessels. The day after the onset of the

hemiplegia the man developed severe dyspnœa, and examination of the left lung showed it to be in a state of complete collapse over at least half the area. This was probably due to the anæsthesia of the larynx allowing plugs of mucus or food to pass into the bronchi. Eight weeks after operation the hemiplegia was fading, but the voice remained hoarse and low. The operation of removing a tumour of the carotid body is a very formidable one. In nearly all the reported cases ligation of all the carotids has had to be performed. The mortality for this operation, ligation of common carotid for aneurysm, is between 23 and 30 per cent. But this is not the only danger, for Pilz has pointed out that 32 per cent. of cases of ligation of common carotid exhibit brain symptoms, and that 56 per cent. of these cases die. Another danger is nerve injury to such important structures as the vagus, sympathetic, hypoglossal, facial, recurrent laryngeal, and in this case to the superior laryngeal. Those tumours should not be removed as long as they remain small; it is only when, by their rapid growth, a fatal issue is inevitable that operation is called for. Surgeons must be wide awake to the existence of such growths and so avoid being led into operating upon what might appear a trivial condition.

W. L. B.

MEDICINE.

UNDER THE CHARGE OF JAMES STEWART, F. G. FINLEY, H. A. LAFLEUR AND W. F. HAMILTON.

"The Causation and Treatment of Headaches." *Practitioner*, July, 1906.

This subject is treated in a series of papers which will repay careful perusal.

Dr. Campbell points out in an introductory paper the impossibility of always relying on the position and character of a headache as a guide to its cause. This is especially the case in headaches which are general, and even local pain should be regarded as suggestive and not conclusive evidence of the cause, for the pain of a cerebellar tumour may be sometimes chiefly frontal, whilst that of a frontal growth is sometimes referred to the occiput.

In the investigation of headache, disease of the nervous system, the cardio-vascular and renal systems should be first excluded. After the eyes have been examined and the sinuses thought of there is a class of cases included under the toxæmias, anæmias and reflex irritations,

between which it is often difficult to discriminate with accuracy. Headaches attributed to reflex causes are not easy to understand. Recent papers by Dr. William Russell strongly uphold the existence of reflex arterial spasm, as a cause of headache, and although the question of vaso-motor innervation of the cerebral arteries still remains a matter of doubt, clinical experience is in favour of a capacity of active contraction of these vessels.

Other headaches, which may be included in the reflex group, arise from the continued contraction of the occipito-frontalis muscle consequent to a strong sensory stimulus. In this manner headaches following exposure to a strong wind, and some of those associated with toothache and other pains, may be accounted for.

Dr. Saundby writes on headaches of renal origin. It is in the later stages of chronic contracting kidney that they are severe and present characteristic features. The typical renal headache is occipital and the site of pain is of some significance. Their symptoms require treatment by light non-nitrogenous diet, purging and vapour baths. Spontaneous hæmorrhage is occasionally followed by improvement, and this has suggested the value of bleeding. The relief obtained by this measure is very transient, the headache recurring in a few days. Phenacetin and coffein rarely fail to give temporary relief. Trinitrin may relieve, but is uncertain, whilst erytholuitrite is more apt to cause than relieve pain.

Intracranial disease as a cause of headache is treated by Dr. James Taylor.

This headache is nearly always *paroxysmal* in character. Although dull aching may be almost constantly present, yet severe, even agonizing paroxysms arise at different times and with varying frequency. Its poroxysmal character probably depends to a large extent on variations in blood pressure, and this is probably the reason why the taking of food, and especially the administration of alcohol, are so frequently followed by headache in gross intra-cranial disease. Nausea and vomiting is another characteristic common to the headache produced by different kinds of intracranial disease, and, although often said to occur independently of food, yet the taking of food is frequently the exciting cause of both nausea and vomiting. Faintness may also be present in cases of intracranial headaches. It is sometimes induced by nausea, or if independent of this, is probably to be referred to pressure on the cardiac or respiratory centres.

In meningitis headache is usually characterized by its constancy as a dull, aching discomfort, varied by severe paroxysms of agonizing pain, often accompanied by sickness. The pain is more severe in the earlier

stages, being masked later by delirium and unconsciousness. In the meningitis of ear disease the headache is often frontal, but in this and other forms of meningitis there is often tenderness over the area corresponding to the inflamed meninges.

An attack of hemiplegia is occasionally associated with severe headache. In this condition the hemiplegia is usually due to hæmorrhage. Thrombosis, even when due to syphlitic endarteritis, is seldom accompanied by headache, but with an accompanying syphilitic meningitis headache may be severe and persistent, both before and after the hemiplegic seizure. Headache in cases of hæmorrhage is usually general, and there may be superficial tenderness of the scalp.

Headache is the most constant symptom of intracranial growth, but it may be absent in cases of slowly growing tumour. When associated with optic neuritis it is almost pathognomonic. The site of pain is, unfortunately, of little value in localizing the lesion. Head believes that deep tenderness and local pain in addition to the general headache indicate localized meningeal irritation. If the pain is occipital and if there is head retraction there is great likelihood of a cerebellar or basal tumour.

The headache of hemiplegia is often much relieved by the use of leeches. Bromide and antipyrin in combination are useful. Nitroglycerine does good in some cases by lowering blood pressure.

In meningitis the ice bag is often a source of great relief, while drugs are mostly inefficacious. In intracranial tumours antipyrin, phenacetin with caffein, aspirin, etc., often give great relief. Morphine is occasionally required in all these intracranial conditions. If it is used, it should be with a full knowledge of its danger — the danger of so reducing the vitality of the already hampered respiratory centre as to possibly induce a fatal result. The operation of triphining and opening the dura mater gives relief in many cases, although it sometimes fails. It may be desirable to carry out this measure even where the position or nature of the tumour is of such a character as to render it immovable.

Migraine and toxæmic headaches are referred to at some length by Dr. Wilfred Harris. Migraine in its various forms is fully described. It is closely allied to other paroxysmal neuroses, especially epilipsy, asthma and vaso motor augina. Indeed, a typical migraine with hemianopia and scintillating scotoma may certainly be looked upon as a sensory epilepsy with a discharging focus in the neighbourhood of the occipital lobe. Epilepsy may be associated with migraine, either in the same person or in near relatives. Bromide treatment as in epilepsy may give marked relief.

Migraine is often associated with a throbbing temporal and occipital artery of the affected side. Pressure on these vessels or the application of an ice bag may bring immediate relief, facts which render it probable that a vaso-motor disturbance is an essential feature of the morbid process. Initial pallor of the face is a familiar symptom, and later throbbing as the headache develops, and it seems rational to believe that a similar process is present in the cortix. If this view is correct, the immediate relief following a profuse epistaxis or compression of the carotid artery is at once explained. Other methods of obtaining relief depend on withdrawing the blood to other parts of the body, as by immersion in a hot bath and applying ice to the head. Sipping hot fluids produces engorgement of the viscera and lessens the pressure in the cerebral vessels. The frequency of the attack in women at the commencement of the period probably depends on heightened blood pressure known to occur at that time.

It is a matter of general knowledge that morphine hypodermically is the only drug which will arrest an attack at the heighth of the paroxysm. This is due to the fact that digestion and absorption are arrested, and indeed, drugs may be vomited unchanged at the end of an attack. The old fashioned seton induces a slight pyrexia and often relieves the frequency and severity of the paroxysms.

A full dose of phenacetin and caffein as soon as the aura appears, with rest for a couple of hours may serve to ward off an attack. For menstrual headache butyl-chloral hydrate in 10 grain doses, with phenazone 5 grs. and Tr. Gelsemium m.x. for two days previous to the period, and continued for its first two days is serviceable. In some cases other coal tar preparations act better and may be tried. For the attack itself massage of the forehead and head with high frequency electricity in the form of faint sparks to the scalp may lessen the pain. In spite of the tendency of static electricity to raise blood pressure, the negative breeze from a powerful machine often effects immediate and lasting relief.

Eye strain and nasal disorders are the subjects of special papers by Drs. Jessep and Lock.

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