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MEDICAL NOTES OF A TRIP TO CUBA.

BY

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Last Autumn Sir William Van Horne asked me to accompany him on a trip to Cuba, promising me that I should see Cuba in all its phases. We left Philadelphia on November 8th and reached Santiago on the 12th. Santiago we found to be quite a model town owing to the wise rule of General Wood. The town is an example to all towns in this or other countries, for, from being the pest-hole of the West Indies it has become a sanatorium. Drains have been made and streets covered with asphalt, a sanitary corps keeps the streets clean, men pushing small waggons pick up every scrap of dirt, and every hour or so the sanitary carts come along and carry off the collections. This, however, is not done at the expense of the City but funds are derived, I believe, from the Customs duties.

Yellow fever has been entirely abolished, no case has occurred for over 18 months and if the mosquito theory of the transmission of the Yellow fever is true, no case can originate there and if yellow fever is seen in the future it will be due to importation. The Santiago Province protects itself by quarantine from Havana where yellow fever exists all the year round.

I think it has been now proved beyond doubt by the experiments of Drs. Walter Reed, Carroll and Agramonte, that the mosquito is the carrier of the Fever parasite. It seems that the parasite of the disease, as in malaria, undergoes a definite cycle of development in the body of the mosquito before the latter is capable of conveying infection. This period appears to be not less than 12 days. A number of soldiers, doctors and others, submitted to the test of being bitten by mosquitos who had already fed on yellow fever patients, and 85.71 per cent. were

infected, their inoculation period being 2 to 6 days. This discovery is important for quarantine is only useful in Southern ports where this kind of mosquito exists and disinfection of clothing and bedding is a work of supererogation.

The name of the mosquito is the *Culex fasciatus*, and the houses in Santiago which have been regarded as centres of infection for Yellow Fever (and were destroyed by General Wood), were only so because they harbored this dangerous insect. To abolish yellow fever it is important to prevent the mosquito biting the yellow fever patient, and of course to destroy the mosquito, a procedure not characterised by any great degree of simplicity, in fact, rather a 'big contract.' If yellow fever cases can be successfully protected from the mosquito by wire screens, etc., then the mosquitos having no more patients to bite won't be able to manufacture the parasite all by themselves—in fact it needs a combination of mosquito and patient to do this. The excreta of the patient have no power of conveying the disease. Dr. Finlay of Havana long ago asserted that mosquitos spread this disease and he made experiments to prove his case.

The number of deaths from yellow fever in Havana in 1900 was 310, in 1896 1,282 died of this disease which only attacks foreigners, natives being, it is said, immune. Dr. Guiteras of Havana, however, says that the reason yellow fever persists so constantly is that many very mild cases occur amongst native Cubans and colored people, and that these cases are not recognized as yellow fever but thought to be malaria or other diseases. The foreigners attacked were Americans and Spaniards. But I have wandered away from Santiago.

The temperature varies little all the year round. It is perpetual summer in Cuba, the winter months being only a few degrees cooler than the summer, 80° to 90°, the average temperature, and the air is charged with moisture which makes exertion in the heat of the day unpleasant. Santiago is situated at the foot of a beautiful bay and encircled by high hills (2,000 to 3,000 ft.). There is a lower and an upper part of the town; in the upper part on a high ridge is situated the General Hospital containing 300 beds, under the charge of Dr. Castillo and his assistants. Dr. Castillo is a brother of the Governor of Santiago Province and was a prominent man during the Revolution and did much for the cause of liberty in Cuba. He is a man of remarkably fine presence and of brilliant abilities. He was educated in the United States and for a time was a surgeon in the American Navy and accompanied one of the Search Expeditions to the North Pole as surgeon. When the Americans took Santiago he was with them, and on the epidemic of typhoid and yellow fever breaking out, this hospital which had been a Spanish military hospital, was made use of.

But as it was thought to be so infected with yellow fever as to be dangerous to Americans it was handed over by General Wood to Dr. Castillo to be used as a general hospital for natives who have practically all negro blood in their veins, and hence are immune to yellow fever.

The place is arranged in large pavilions round a central square containing beautiful trees and flowering shrubs. In this part of the country all the buildings are of one story and this hospital is no exception to the rule: there are no problems of ventilation and heating to wrestle with, everything is built for summer. The hospital is clean and well managed and much good work is done. Dr. Castillo has lately had several successful cases of extirpation of the uterus of which I saw two rapidly recovering. He has collected money enough to build a steam laundry and expects to light the place with electricity when he gets his plant for the laundry. He has also nearly completed a very good children's hospital, the money for which he himself collected.

I saw some cases of malaria there, all apparently originating outside the city and I am told by Cuban medical men that besides the ordinary malaria there is a pernicious type somewhat like the 'Black water Fever' of Africa, also there are occasional cases of typhoid though these are not numerous. There is a fever seen not infrequently in Cuba which is not malaria, because it does not yield to quinine, nor are organisms of malaria in the blood, nor yet is it typhoid for the blood does not react to any typhoid test. It is characterised by high temperature and great prostration and but little seems to be known about it. A systematic investigation is needed to determine its nature.

Whilst at Santiago Dr. Castillo asked me to perform some operations. The first case I operated on was one of obstruction of the bowels which had lasted four days and was most interesting because it turned out to be a case of pro-peritoneal hernia with gangrenous bowel. I had to resect about a foot and a-half of the intestine. The man stood the operation well and when I left was progressing favorably. Another case was an enormous osteo-sarcoma of the lower jaw in a woman, from whom I removed the greater part of the lower jaw. In this, as I always do in tumours of the neck, I freed the lower part first, securing the blood vessels, and then found no difficulty in disarticulating the jaw and removing the growth and it together. Patients in Cuba seem to stand operations fairly well, though, probably owing to the poor food they consume, do not stand loss of blood well. The operating room was well equipped and well lighted, quite modern in every way and besides this it is fly and dust proof.

There are quite a number of lepers in Santiago, some 300 I was told, and I saw several in the streets. There is a small house attached to the hospital which has four lepers in it, all early cases. I visited the

Lepers Hospital in Havana and was most interested therein. It is called "Casa Hospital de San Lazaro," and was founded in 1681, by Don Pedro Alegre. The present building and foundation dates from 1823 and although it gets grants from the Government and the City still it is chiefly supported by bequests and donations. As one goes into the front doorway one finds oneself in the portico of a large church. This part is free to the public. On entering the church one sees on each side of the chancel transepts separated from the church by a high iron railing in which the lepers sit and attend service and also at the same time can see their friends who come to the church. The women are on one side and the men on the other. The hospital, the pavilions of which are around a large court, contains 100 patients in all stages of the disease. The ones upstairs are the far advanced cases and confined to their beds, helpless, blind and maimed people, whose sad state makes one shudder to see and whose only hope is a speedy death. The corridors on the ground floor are peopled by lepers who can move about, they eat in a common dining room and seem moderately happy. I saw many of the comparatively early cases, chiefly of the anæsthetic tubercular variety. The medical head of the hospital I did not see, Dr. Manuel Alfonzo, but everything seemed in perfect order and very clean. The nursing department is in charge of a community of nuns who also look after the feeding of patients and dispensing. I was taken about by the Mother Superior and a Sister. The Sister was a charming woman, bright and talkative, and hailed from Limerick, Ireland, she told me that up to the time the Americans came she had not spoken English for 20 years, and had almost forgotten how to speak it; she had, however, preserved intact a very rich Irish brogue which was delightful to hear in Cuba. She informed me that since the nuns had charge not one of them had ever contracted leprosy nor had any of the assistants, although they had been in charge for over 75 years. In her experience several cases had been discharged cured, Chaulmugra oil being the great remedy.

I took several photographs of the lepers and they seemed rather to like it than otherwise. There was one native American patient, he had been living for years in Cuba and contracted the disease in Porto Principe. It is said the Government of General Wood in the near future intends to remove the lepers to an adjacent island. The patients themselves object because they will not be able to see their friends. At present patients cannot be compelled to go to a hospital and their entry is purely voluntary, but once they enter are not allowed to leave. There seems to be a general impression in Cuba that fish eating has something to do with the production of the disease, this is also the opinion of Mr. Johnathan Hutchison.

I was much interested, while in Havana, in the hospitals there. One large public hospital in the outskirts is being remodelled and a considerable amount of money is being spent by the Government to make the wards and equipment the most modern. This includes a steam laundry, an electric light plant and a most modern up-to-date operating room. The nursing is in charge of American ladies who are endeavoring to train Cuban girls as nurses. As the hospital was undergoing extensive alterations, I did not see it under very favorable auspices, but what I saw impressed me greatly. I saw an abdominal operation in which every modern aseptic precaution was taken.

There is also another hospital. No. 1, which was occupied by Spanish soldiers during the war. It consists of a number of detached wooden pavilions connected by galleries. It can be made to accommodate 3,000 patients. American nurses reign here also and everything was clean and in perfect order. The operating room was modern, especially as regards gynæcology. The Yellow Fever Hospital I did not visit.

Dr. Fernandez, the president of the Pan-American Medical Congress which met recently in Havana, spent a day taking me about. We visited the Medical School, which consists chiefly of class rooms and a dental department which was well-equipped with modern dental chairs. The dissecting room was small and contained only a very few tables on which there were a couple of subjects. At the time I was there there was no dissecting going on by the students, but some of the demonstrators were hard at work making some very beautiful preparations of the foot and knee. I also visited with Dr. Fernandez a large building on the university grounds which has recently been handed over to the Medical Faculty for Laboratories: there was a fine histological laboratory in the process of equipment but I saw but little provision, beyond rooms, for physiology, chemistry or pathology. Museums were conspicuous by their absence.

In the hospitals there were no arrangements by which students could see operations and I could not gather that there was any special clinical teaching. Dr. Fernandez is one of the most progressive of men. He has a large laboratory and library at the top of his house, he has skilled men trained in Pasteur's laboratory, continually experimenting, making antitoxines for diphtheria and tetanus and examining pathological specimens. He keeps four horses below stairs from which he gets the serum, all the horses looked in perfect condition, one especially which he has had for two or three years and from whom some hundreds of quarts of blood have been drawn, is especially lively and healthy. Dr. Fernandez did all this at his own expense and at first gave all his antitoxine away, but now he charges for it at cost; his laboratory is made much use of by the practitioners in Havana. He has an immense

medical library and is the Editor of "The Cronica Medico-Quirurgica de la Habana." Dr. D. J. Santos Fernandez, is the most prominent ophthalmic surgeon in Cuba.

I visited also two private Spanish hospitals, one conducted by the Association de Dependientes del Comercis de la Habana. This Society has a magnificent hospital in beautiful grounds called the "Quinta de Salud la Purisima Concepcion." The hospital consists of separate buildings, a large administration building, a large building containing a complete hydropathic establishment hot and cold water in every form and hot air and steam baths with all kinds of douches, which are managed by the director from a kind of pulpit; separate buildings for males and females and a very fine new operating theatre. This Society is very wealthy and has been in existence for years. It started first as a cottage hospital as its name 'Quinta' implies, and soon it grew larger and larger until it reached its present size. Each member pays \$1.50 a month, or \$18.00 a year, and as there are 13,000 members, their income is about \$234,000 a year. They have a surgeon-in-chief and physician-in-chieif who are each paid \$3,000 or \$4,000 a year, and their assistants in proportion. Each member of the Association is entitled to a private ward and free medical and surgical attendance when ill. He can have his own doctor in preference to the regular surgeon or physician of the establishment. He can recommend anyone to this hospital to one bed. Although there are some 200 beds, when I visited the place there were only 50 patients actually being treated.

I visited another similar institution kept up entirely by natives of Asturias in Spain. This was not so modern as the one I have just described but has most charming grounds with a wonderful collection of tropical trees about it and lovely gardens. It has occurred to me that such a society for the establishment of an infectious hospital would be of advantage here. Let each member pay a stated sum into the society yearly, this would entitle him to one bed for himself or any member of his household. A membership of say 2,000 at \$10 per annum would give \$20,000 a year, for which a moderately sized hospital could be run. It would be like an insurance against infectious disease and when such diseases did come to us we could send members of our family to a place which would be modern, scientific, properly managed and comfortable. In every town in Cuba these Spanish private hospitals exist.

Another institution I visited was the Foundling Hospital (Maternidad). A very old foundation and apparently very well managed. It is of huge size. There is a turnstile containing a basket in which infants are deposited from the street; on passing through the opening the basket strikes a series of bells, the noise of which arouses the nun

on duty. She takes in the waif. They keep the clothes and trinkets found on the babies in a huge glass case for future identification. Some of the clothes were beautifully worked, and some of the trinkets valuable. The foundling remains in the institution until they learn a trade. The boys learn printing, carpentering, shoe-making, etc., and the girls are trained in house work for servants. The place is under the charge of a community of nuns. The inmates all appeared very happy, and were of all colors—no color line there being tolerated. I was treated most courteously and shown everything. In one case are a number of photographs of former inmates who have been successful in life. Many of these I was told became benefactors of the institution.

Tuberculosis is very prevalent in Cuba, and among the colored races is very fatal. This is strange, for the inhabitants practically live in the open air. Of course, when colored races mix with white their powers of resistance to disease seem to be lessened. The people wear little clothing, and in the country children up to 10 or 12 years of age go naked. Babies, even of the better classes, never wear clothes. The lower classes live in huts made from the palm tree, the roof is formed from the leaves, the sides from the trunk, and the bark is used to divide the rooms and fill up the crevices. Doors and windows are usually mere openings closed with mats. The people sleep usually in hammocks.

Although perhaps the best tobacco in the world is grown in Cuba, many of the better classes do not use it. In several of the tobacco factories I visited the proprietors did not smoke. Smoking, however, is very prevalent among the lower classes. They raise their own tobacco and make their own cigarettes and cigars. Women smoke as much as men, and it is no uncommon sight to see a procession of women with baskets or water jars on their heads, and in the mouth of each one a huge black cigar and clouds of smoke obscuring their swarthy countenances. It seems to agree with them, for they all look well and happy.

In a town in the centre of Cuba one of my friends got ill, with what, I know not. He had severe headache, vomiting, backache and a very high temperature. I saw him and advised him to get a local doctor, as I was not acquainted with the tropical fevers. My friend, who had spent some 20 years in the tropics, was sure he had yellow fever, as he had seen many cases. The local doctor examined him carefully, and after examining the urine, said it was not yellow fever, but could not say what it was. They rest their diagnosis of yellow fever entirely on the fact of there being albumin in the urine. As he was in an uncomfortable hotel, I went to the Spanish private hospital, became a subscriber and arranged for my friend to have a private ward. But before removing him I had to have the doctor of the hospital see him

and the two had a consultation which lasted some 30 or 40 minutes, and was held in voluble Spanish over the bedside of my friend, who understood and spoke Spanish perfectly. During the consultation innumerable cigarettes were consumed, and the patient was surrounded by a halo of smoke.

After a time the consultation was transferred to the next room, and my friend told me that the hospital doctor said that he had yellow fever, but the other held to his first opinion. Having the carriage at the door, I called to one of the doctors, who spoke French, and said I was going to take my friend to the hospital whatever the disease was. They submitted to my decision with Spanish politeness (for a Spaniard would rather be accused of murder than impoliteness), and I took my friend to the hospital, where the doctors fought out the diagnosis for several days; in fact, until my friend was out of danger, as they said if he lived over the fifth day it is not yellow fever. My friend told me that whatever they considered the disease to be they were treating him for yellow fever, and the treatment is very simple,—purge in the morning, again at noon, and again at night, and do the same next day. My friend recovered in ten days, and to this day no one knows positively what disease he suffered from.

Apparently, as the diagnosis of yellow fever in Cuba depends entirely upon the presence or absence of albumin in the urine, many mistakes occur, for it is well known that numbers of cases of yellow fever have no albumin in the urine. Again, many cases of yellow fever are, I believe, so mild that they are unrecognisable. The doctors in Cuba, except in Havana, do not seem alive to the blood examination in malaria and typhoid fever, if they used this oftener they would, I believe, exclude more cases of so called yellow fever.

Havana is a beautiful city, but still undrained, but they are now undertaking a huge system of drainage and paving, which will, it is said, when completed, make Havana a veritable sanatorium.

Cuba is a wonderful country for the raising of all forms of food. Before the war good beef could easily be got very cheaply, and immense herds fattened on the rich guinea and parana grass, which grows so luxuriantly in the province of Santiago. As a rule, the cows give but little milk, and butter is not made in any quantity; the feed goes to beef, not milk. Imported butter in tins is used everywhere, and also tinned cream and condensed milk. Oleo-margarine is very popular because it never gets tainted. In the hospitals all the milk I saw was boiled immediately on receipt; they do not seem to have yet introduced Pasteurisation. I several times had my attention drawn to the thick yellow crust which formed on the boiled milk, and which was pronounced beautiful cream. All kinds of fruits are most abundant,

oranges, limes, grape fruit, custard apples, alligator pears, bananas and plantains, sapodillos, mangoes, etc., and many other kinds the names of which I forget.

Cocoa-nut water is much recommended as a diuretic. It is only used when clear and limpid in the green cocoa-nut. Bananas are never eaten raw, always roasted or boiled, taking the place of bread. Sweet potatoes grow well, but the Yuca root is the favorite substitute for the potatoe. It is these roots from which tapioca is made. It struck me as very curious that so much pork and ham was eaten in such a hot climate but every hut has its quota of pigs. These are of the razor-back variety, and are semi-transposed at certain seasons of the year; however, when the nuts of the Royal palm are ripe and ready to fall, the pigs congregate about the trunks of these trees, which are of large size and very numerous, and open their mouths and wait for the nuts to fall into them. They now get very fat, and are soon ready for killing. Pigs fed on these nuts make most delicious pork and very sweet hams.

There are many wild pigs on the island, probably imported. Also deer, guinea-fowl and pigeons; there are few native animals, no monkeys, and what is very fortunate, no poisonous snakes. One snake, the Ma La, grows to some 15 feet in length, but is harmless, and is tamed as a house pet to kill rats. There are a few scorpions and tarantulas, the latter only of which I saw when I looked for them; they rarely attack you unless irritated. All the rivers abound in Caymans (a kind of crocodile), and when going in swimming one has to employ small boys to throw stones to keep these creatures away. They are not very wicked, but are said to be fond of dogs and pigs. In all the bays sharks abound.

Amongst the curious things I saw in Cuba were lobsters without claws and oysters growing on trees. Both were favorite articles of diet. Shrimps also were very good, and also guava jelly, which is eaten with cheese at every meal. Every small landed proprietor raises everything he wants to eat, such as bananas, Yuca root, oranges, coffee and sugar canes and pigs. He can raise several crops a year and support a family on an acre or two. Hence, where living is so easily got, the people are very apt to be lazy, and the Cubans are no exception to the rule.

We left Havana on Dec. 11th for New York dressed in linen suits, and with a thermometer of about 80 degrees; in two days we were glad to put on heavy flannels, thick suits and overcoats, and when we arrived in New York on the 15th we found everything frozen up and the thermometer down to zero. Thus ended a most pleasant six weeks holiday. The last man I shook hands with on the steamer in Havana died at Ciego in the centre of Cuba three weeks after our departure.

ON THE SIGNIFICANCE OF CERTAIN PHASES IN THE LIFE HISTORY OF THE MALARIAL PARASITES.

BY

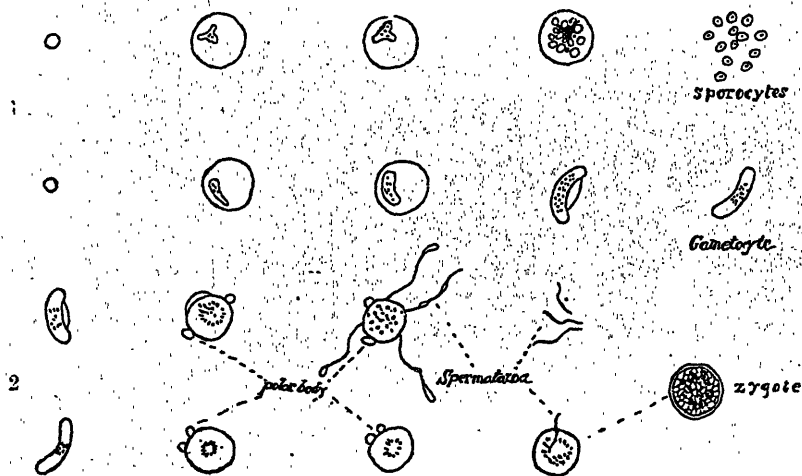
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In a recent number of the "Quarterly Journal of Microscopical Science," Prof. Lankester (1) in commenting on Drs. Ross and Fielding-Ould's (2) excellent paper on "The life-history of the parasites of malaria," has drawn attention to the significance of certain of these phases, which, although mainly of morphological and biological importance, are nevertheless of such general interest as to merit the attention of other than the pure morphologist or biologist.

To recapitulate briefly a familiar subject, the life-history of the malarial parasite is somewhat as follows: The youngest parasites are found as minute amœbulæ within the red blood corpuscles of the animals which they have infected. After growing for an interval of one or several days within these corpuscles they reach maturity, and develop into either *sporocytes*, or *gametocytes*. In the case of an amœbula that becomes a sporocyte, the nucleus divides into a number of segments, each of which surrounds itself with a small portion of protoplasm and becomes a *spore*, the process being identical with the ordinary process of asexual reproduction or multiplication of bacteria by fission. The corpuscle finally bursts, allowing the spores to go free, to attach themselves to fresh blood corpuscles, therein to grow and repeat their cycle of development. In the case of a gametocyte, the nucleus does not divide, and the parasite reaches its full maturity without showing any signs of spore-formation. "As their name indicates, the gametocytes are sexual forms, male and female. They possess no function within the vertebrate host, but are meant to continue the life of the organism within a second host—a suctorial insect." These changes will be better understood on reference to figure 1, which is taken from Ross's diagrams (2). Within the blood of man the gametocytes undergo no further development, only undertaking their sexual functions when drawn into the stomach cavity of a gnat. Here they swell up slightly. The male gametocyte gives origin to a number of microgametes or spermatozoa, the female gametocyte develops into one large macrogamete or ovum. The microgametes or spermatozoa possess very active powers of locomotion by virtue of which they wander about till they encounter a macrogamete or ovum, which they imme-

diately enter and fertilise. These changes are depicted in figs. 1 and 2. It seems singular, as Lankester has remarked, that we should find in these most minute Protozoa, a process of fertilization identical almost step for step with the process as we find it in the vertebrate phylum. One can hardly read MacCallum's (3) graphic description of his discovery of this process without feeling how well his words would describe the fertilisation of the egg of an echinoderm, or a fish, as we see it under the microscope. After fertilisation, the fertilised ovum, or as it is now called, the "zygote," affixes itself under the outer muscular coat of the insect's stomach remaining motionless and growing rapidly in size. It develops a distinct capsule, its substance dividing up into from eight to twelve round bodies or "meres." Each mere consists of a central residual mass of protoplasm or "blastophore," whose surface is covered with numerous filamentous



FIGS. 1 and 2. Diagrams illustrating the life-history of the parasite of aestivo-autumnal fever of man: *Haemomenas praecox*. The upper two rows of figures representing the changes taking place during the growth of this parasite within the blood of man, the formation of sporocytes and gametocytes. The lower two lines of figures represent the further development of the gametocyte within the stomach wall of the mosquito (*Anopheles*), the polar bodies and the spermatozoa or microgametes are shown, finally the fertilized macrogamete or zygote.

bodies or outstanding processes, the "blasts." Fig. 3. When the zygote reaches maturity, the central residual mass or blastophore disappears, and its capsule is left crowded with these blasts, which finally burst their capsule, wander free in the body cavity of the gnat, to collect in the salivary glands of the insect, to pass thence into a fresh host, there to develop again as minute amebulae. Now the peculiar part of this is similar to the manner in which the male elements or spermatozoa develop in a very large class of animals, in fact, it is not quite

developed in a very large class of animals, and it is not quite certain but that all animals conform to this type in the development of their spermatozoa. Lankester has, for example, cited the manner of development of the spermatozoon in the earthworm (*Lumbricus*), as described some years ago by Bloomfield (4).* Here one has only to glance hastily at Bloomfield's figures, a few of which are reproduced, figs. 4 A. B. C. D., to see how close is the resemblance in the two cases. (Compare figure 4 D. with figure 3, which represents the corresponding stage in the case of the malaria parasite.) In the case of the earthworm we get the division of the mother sperm cell (fig. A), into a number of cells, which become arranged around a central residual mass or "blastophore" (fig. 4 C and D), as he calls it, from which they become free and swim about as active and independent units, similar to the manner in which the malarial blasts become free from the central residual masses of their meres or blastophores. But of course, in the case of the malarial parasite, we have this distinction, that these blasts, although resembling spermatozoa in the form and manner of their development, do not serve the purpose of fertilising an ovum as the spermatozoa of the earthworm do, but directly continue the life of the species, in a fresh host. Throughout the range of the animal kingdom, and the vegetable kingdom also for that matter, this is the first example which we have of the perpetuation of the race by means of a cell, which in shape and manner of development is a microgamete or male element. We are accustomed to find the product of the fertilised cell resembling in every case the macrogamete or ovum, in this respect the malarial cell and its allies form an evident exception to the rule. For these cells, or blasts, Lankester has proposed the name of "andromorphous" or "spermatomorphous" blasts or cells, in contradistinction to the ordinary "öomorphous" or "gynæcomorphous" blasts or cells of the tissue forming plants and animals. "We are certainly accustomed," states Lankester, "to associate the phenomenon of non-sexual reproduction in the higher animals with the production of öomorphous cells. It is only an egg cell which is capable of multiplication and the production of new individuals of the species, without conjunction with a fertilising cell (parthenogenesis). There are no cases on record, at any rate among animals, of parthenogenesis by means of male cells or male individuals. Speculation and experiment have both been brought to bear on the question as to whether an andromorphous cell (a spermatozoon) can be made to develop a new individual if supplied with a cell body without the addition of the nuclear matter of an öomorphous cell.

* See also Calkins' "Spermatogenesis of *Lumbricus*." *Jour. Morph.*, vol., XI., p. 271. 1895.

It seems to me we have in the case of the spermatomorphous or andromorphous blasts or "young" of the malaria parasite a distinct proof that the spermatozoon is, so far as its essential nature is concerned, capable of acting the part of the solely sufficient germ in a parthenogenetic reproduction or multiplication, and that it is, therefore, not of the essence of "solely sufficient germs" that they should be egg cells or oömorphous. At any rate, we have, I think, in the blasts or filiform young of the malaria parasite, an altogether exceptional case of elements of the male form carrying on without acting as fertilisers, but as "solely sufficient" for the life of the species. We have here, indeed, a parthenogenesis by means of male elements. The parthenogenesis hitherto known in animals is "gynæocratic," that exhibited by the blasts of the *Hæmamœbidæ* is "androcratic."



FIG. 3. Isolated blastophore of the malaria parasite, bearing a number of blasts affixed to it, each by one extremity. (Ross and Fielding-Ould.)

While the multiplication of the flagellate zoospores of some plants may perhaps be placed in this same category of reproduction, yet it is the peculiar mode and manner of the development of these blasts in the malaria parasite, as Lankester remarks, which so truly stamps them as male cells, and renders comparison with this process as it occurs in the Protophyta quite a different matter. Numerous attempts have been made from time to time, to compare the process of conjugation as we get it in such organisms as *Paramœcium*, and *Stylonychia*, with the process of the union of the germ-cells in the multicellular animals. Bütschli long ago pointed out how cell divisions tend to run in cycles, each of which begins and ends with a process of conjugation or fertilisation. While the cells produced in the multicellular forms, as the result of one act of fertilization or conjunction cohere to form the multicellular body, in the unicellular forms, the cells produced as the result of one cycle following conjunction, are collectively comparable to the multicellular body. While, on morphological grounds this comparison is quite correct, and is the base of Haeckel's and Virchow's conception of the "cell-state," it affords little or no light on the subject of fertilisation or conjunction. Although we know in the case of the infusoria, con-

junction is certainly a necessity, we are just as certain in other unicellular and even multicellular forms it is unnecessary. Within the phylum of the Protozoa, we find every gradation in the evolution of the process of bi-sexuality, from the most primitive form of conjunction, to a process of conjunction so similar to the fertilisation of the vertebrate egg, as in this case of the malaria parasite as to be almost identical. Does not this afford us additional evidence, to what we have recently learnt regarding the phenomenon of cell division as presented by the protozoa,* that in the class of the protozoa we have arranged side by side animals, which, although resembling one another in their

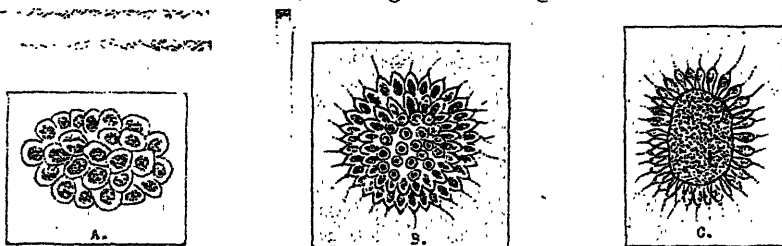
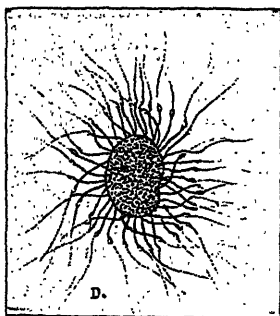


FIG. 4. Development of the Spermatozoa of the earthworm according to Bloomfield.

- A. Mother sperm cell of the earthworm undergoing segmentation into small cells from which the spermatozoa ultimately form.
 B. Further stage in this segmentation, the beginning of the central mass or blastophore. Formation of the tails of spermatozoa in the outer cells.
 C. More advanced stage showing the central blastophore now well formed.



D. Still later stage spermatozoa nearly mature, but still adherent to the blastophoral body.

apparent simplicity of form and structure, are otherwise but distantly related? Sir Michael Foster has somewhere remarked, in speaking of the results of physiological experimentation on the infusoria, that the apparent simplicity of these Protozoa is in many cases a veil, which covers and hides a vast antiquity, and is after all perhaps the most serious obstacle with which we have to deal in drawing conclusions

* See Calkins Jour. Morph. Vol. XV., p. 711. 1899.

regarding them. As regards the reproductive elements of the malaria parasite, however, there is nothing about them which is for a moment a matter of conjecture, every stage has been repeatedly confirmed over and over again by the most competent observers. As a matter of fact, these elements were first described in the Coccidiidae (closely related forms to the malaria parasites or *Hæmamoebidae*), in the summer of 1897 by Simond (5). He showed that in the case of *Coccidium oviforme*, a familiar and well known parasite of the epithelial cells of the rabbit's intestine and liver, while the majority of the parasites become sporocytes, infecting fresh cells, under certain circumstances a few grow large and become macrogametes or ova, while others give rise to an outgrowth of spermatozoa or microgametes, resting on a central residual mass or "blastophore," as we get in the case of the earthworm, Fig. 4. In fact, Simond, judging from the conditions which he found in the Coccidiida, was the first to suggest that in the malarial organism, we might expect to find a similar process. We now know of many species of Coccidiidae which produce microgametes and macrogametes, similar to the above. Podwysoski (13), Clark (14), Simond (5), having described them in *C. oviforme*, Schuberg (6), in the coccidium of the mouse, Labbé (8), Simond (5), and Siedlecki (11), in a coccidium of the triton, Simond (5), in *C. salamdrae*, Léger (7) and Hagenmüller (12), in the genera *Diplospora* and *Barroussia*, while Léger (7), and Wasielewski (9), have found recently a peculiar form of microgamete in a coccidium of Myriapodes, which has the form of an elongated club, bearing two cilia in its anterior surface. The real significance of the microgamete was first surmised in 1895 by Schuberg (6), whom Siedlecki (11) quotes, regarding the microgametes of the coccidium of the mouse as follows, ". . . namentlich könnte man daran denken dass die Formen eventuell eine Copulation vermitteln möchten." In this, however, he was probably forestalled by Labbé as far back as 1891.

In the case of the malarial parasite, a point of some considerable interest arises in connection with two small bodies found in relation with the maturation of the male and female gametocytes. (Fig. 1 and 2 polar bodies.) They resemble in shape and mode of origin the polar bodies arising in connection with the maturation of the ova of multicellular animals. Ross has suggested that in the malarial parasite they are of this nature. The suggestion is a very tempting one; we must have, however, a more detailed account of their origin, the nuclear changes that take place with regard to them, before we can finally accept this conclusion, their presence so far being seemingly somewhat inconstant. It will be observed that in the case of the

malaria parasite they arise in connection with both the female and the male gametocyte, the polar bodies proper of the higher animals arising only in connection with the female element. Our ideas to-day regarding the development of the polar bodies and the maturation of the germ-cells date from Van Beneden's epoch-making discovery, that the germ-cell contains only one-half the number of chromosomes of the ordinary tissue body cells. Thus, on conjunction of the germ-nuclei in the egg, the number of chromosomes are kept constant instead of being doubled on each act of fertilization, as they would be if the germ-cells contained the same number as the body cells contain. In man, for instance, the number of chromosomes in the body cells is said to be sixteen, their number in each germ-cell is eight, the union of the two germ nuclei in fertilisation gives the egg the full sixteen chromosomes of the body cell, eight of which are derived from the male, eight of which are

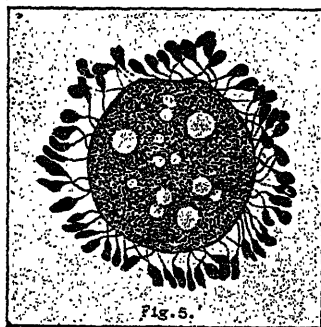


FIG. 5. The formation of spermatozoa in the coccidium of the occipus, the spermatozoa are seen adherent to the residual mass or blastophore, similar in manner to the way they adhere to the blastophore in the case of the earthworm. (Siedlecki.)

derived from the female side. Beyond this primary halving or reduction of the chromosomes in the germ nuclei, we know little or nothing of the real significance of the phenomena connected with their maturation. When we attempt to advance beyond this we meet with the most contradictory observations, and diverse opinions, this being one of the most difficult and obscure fields of biological research. All agree that the final reduction of the chromosomes in the germ-cells is effected in both sexes, by the last two divisions by which the definitive germ-cells arise from the primordial mother germ cell. In each case, four cells arise from these two divisions. In the case of the female, only one of these four cells reaches maturity as the ovum, the other three aborting; *they are the polar bodies*. Thus in the higher animals it will be seen that the polar bodies are peculiar to the maturation of the female germ-cell. No similar bodies have been found in connection with, so far, the

maturition of the male and female elements of the Coccidiidæ. Siedlecki (11) has endeavoured to trace the changes taking place in the germ nuclei during fertilization in a coccidium of the octopus, to see whether a true process of reduction occurs here. While he has been unable to establish this very definitely the problem, as he remarks, being "difficile à trancher," he has rendered it more than probable that a true process of reduction really takes place here. In the macrogamète or ovum, he suggests that this reduction is effected by means of numerous small bodies of darkly staining substance, which are extruded from the nucleus during fertilisation, and are seen for some time outside the nucleus in the cytoplasm, finally disappearing, being probably broken up by the cell and excreted. In the formation of the microgametes or spermatozoa, no polar bodies are found similar to the ones in the malarial organism, the reduction being here "probablement lieu par le fait de leur formation en nombre considérable aux dépense d'une cellule," a reason more than once put

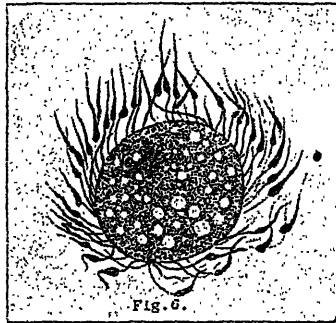


FIG. 6. Formation of spermatozoa in the coccidium of the octopus, later stage than Fig. 5, spermatozoa nearly mature. (Siedlecki.)

forward to explain reduction in the male elements of higher animals. In the infusoria we undoubtedly get a process of reduction, the nucleus dividing up into several pieces, one of which only takes part in conjunction, the other degenerating and perishing like the polar bodies. In *Paramœcium caudatum* Hertwig (15) tried to count the chromosomes. While he was unable to do so with absolute certainty, he found that before reduction there were approximately eight to nine, after reduction four to six, practically a halving of the chromosomes. In the Gregarinidæ, a closely related class to the Hamamœbidae, Wolters (16), while he was unable to count the number of chromosomes, has observed the formation of an actual polar body, cast off from each of the animals at the time of their conjunction. Here the process would seem to be identical with the condition in the malaria parasite. In some of the

unicellular plants a complicated process has been described by Chmielewski, where the nucleus, after conjugation, divides into two parts one of which breaks up and degenerates, being apparently digested by the cytoplasm, the other persists as the permanent nucleus. In this case the process seems to resemble the condition found in the Coccidiidae, if Siedlecki is correct in considering the dark bodies extruded from the nucleus during conjunction as true nuclear material. Perhaps no want is more necessary to-day in biology, than a wider and more comprehensive knowledge of the whole problem of reproduction, in all its various forms.

The discovery in the malarial parasite of some such relation between the asexual and the sexual modes of reproduction as Maupas has established for the Infusoria, might prove in the future of some practical value. He has established the fact that in the infusoria, in order for conjunction to take place, the conjugating animals have to be from different cultures, the sexes of the same culture not pairing together. He has also shown that the sexual mode of reproduction can be entirely suppressed, if the animals be grown on exceptionally rich culture media, going on reproducing themselves by fission until the culture finally dies out from senile degeneration. It is not only the lower animals and plants that exhibit merely a relative need of sexual reproduction, but many of the higher ones also. In bees, for instance, the egg invariably develops into an adult whether it is fertilised or not, the fertilised eggs producing female bees, the unfertilised drones. Perhaps one of the most singular examples of the relation of the sexual to the asexual mode of reproduction is exhibited by the alga *Ectocarpus* as described by Berthold (17). Here the macrogamete or female cell, on reaching maturity, comes to rest for a few minutes. If it does not happen to be fertilised by a male cell during these few minutes of rest, it draws in its flagella completely, becomes spherical, and prepares itself for parthenogenetic germination. The male elements have also the power of spontaneous development, but this development never gets beyond the embryonic stage.

While this need for fertilization may only seem relative, it probably occurs, however at some time in the life-history of every Protozoon though the exact period and the conditions under which it may occur seem to vary greatly even in closely related species. Hertwig in a recent paper (18) claims that in the Protozoa a true process of fertilization as we understand it in multicellular animals is not present; that what we have is a process of division in manifold shapes, accompanied by a need for the reorganisation of the unicellular body, accomplished from time to time by conjugation.

In the Coccidiidae and Hemosporidae we get reproduction by fission producing cells, a certain few of which develop into sexual elements; these reproduce the species through the interposition of some intermediate host. The essential requirements of this process being, first, the production of the sexual elements, and secondly, development in the tissues of some intermediate host. Now, if we can by any means at our disposal interfere with either of these requirements, it is obvious we can hope to control the spread and growth of these organisms. In the malaria parasite; then, we have the choice of endeavouring to so influence the growth of the amebule within the blood as to cause them to lose their power of producing sexual elements, or what is much more feasible, by destroying or removing the intermediate host we can prevent the further development of the sex elements once they have formed. This, of course, can be accomplished by the destruction of the mosquito or gnat, an operation now being extensively carried out in many countries.

Woods Holl, August, 1901.

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ON THE FREQUENCY AND DISTRIBUTION OF GOITRE IN THE ISLAND OF MONTREAL.

BY

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All are familiar with the existence of goitrous regions in the Old World, with the prevalence of goitre in Switzerland for example, in certain parts of France, in Norway and also in certain districts of Germany, and with its so very frequent occurrence in the Peat District in England, that there, in the Old Country, it is still spoken of as "the Derbyshire neck." Certain writers have described fully these endemic occurrences in Europe, bringing forward various theories in explanation. In Switzerland, Bircher¹ has advanced the geological theory, *viz.*, that goitre is limited to districts overlying Silurian and Devonian formations, and to the Carboniferous and Permian deposits. Johannessen² has reached practically the same conclusions in regard to Norway. Berry³ in England, finds goitre only where there are chalk and sandstones of Triassic development, while it is absent where there are eruptive rocks. Kocher has brought forward evidence to show that the water habitually drunk has to do with the development of goitre and that, therefore, Bircher's results are not wholly correct. As to what in the water leads to the disease, observations have so far given negative results. Lustig and Carle⁴ carried out certain experiments with animals, the results of which suggest that the water in so-called goitrous districts contains infective agents which are capable of inducing the disease in persons and animals hitherto free from the disease. Hirsch, A. von Humbold, and Virchow held long years ago that some thing of a miasmatic nature must lead to the development of the condition. Still, an analysis of the numerous records of bacteriological examinations of goitre waters reveals nothing but what is most unsatisfactory. Lustig and Carle indicate a bacillus which liquefies gelatine as being constantly present in the goitrous waters examined by them; Kocher points out that goitre waters are distinguishable from non-goitrous in Switzerland by the relative abundance of bacteria which they contain. Klebs found certain infusoria, Bircher a diatom together

with polymorphous bacteria, while Waters has recently suggested that certain amœbæ are present therein, upholding a theory somewhat similar to the present popular sporozoon theory of cancer and malignant growths. This bacterial or miasmatic theory remains to-day as it was many years ago—still a theory without any sufficiency of positive facts to establish it.

The prevalence of goitre in the New World has not received so much attention. Nevertheless here we have well marked goitrous regions. In Canada more especially, as has been pointed out by Springle⁵, goitre is common along the St. Lawrence from Quebec City upwards to the Ontario peninsula. It is however remarkable how scanty is the literature upon Canadian goitre—how those living in the midst of it pass it by. Since the operative treatment of the condition has become more popular somewhat more has been written, here in Montreal more particularly by Shepherd⁶, while McPhedran of Toronto has called attention to the extent of the allied condition of cretinism in Ontario. To our knowledge, however, no writer of late has attempted to estimate the frequency of the occurrence or the boundaries of the regions in which goitre occurs in the Dominion of Canada. As a preliminary step towards gaining such knowledge Dr. Adami recently sent out circulars throughout the Dominion to altogether close upon a thousand medical men, and he asked me to study the replies. While undoubtedly very interesting and affording valuable material, these replies did not give us all the information necessary to enumerate clearly the extent of the disease. There were too many gaps, nor were the boundaries of the different districts reported upon defined with sufficient clearness. In the meantime as a preliminary study it seemed that more valuable information would be obtained by working upon a less extensive scale, by taking a well-defined district and striving by a thorough canvass of the medical men practising therein, to obtain definite data. To this end I have confined the search for the present more particularly to the Island of Montreal.

This island, thirty miles long by ten miles wide, is situated in the mouth of the Ottawa river at its junction with the river St. Lawrence. In general configuration the island is a plain gently sloping in all directions from Mount Royal, an eruptive mass of rock, much the worse for wear, which rises abruptly near the centre of the island to a height of eight hundred feet above sea level. The remainder of the island is but sixty feet above sea level. The soil varies from a sandy loam at the extremities of the island to fairly stiff clay plentifully strewn with granite boulders in the central portion. In several localities a heavy blue clay forms the lower strata of the soil. The depth of soil ranges

from a few inches to several feet, but nowhere is it of every great depth. The rocks underlying the soil are chiefly Silurian Limestone, with here and there an outcrop of Lower Laurentian, the strata of both formations being much distorted and intermingled by volcanic action. There are but few natural springs in the island and consequently there are few marshes though here and there, owing to the shallowness of the soil, the surface water remains for a long time during the early spring or after heavy rains.

Regarding the water supply of the inhabitants, the citizens of the city of Montreal and those people living near the shore use river water, chiefly Ottawa river water, which is "soft" and contains a low percentage of salts of lime. Those people living inland depend upon wells for their water supply. These are more or less shallow and invariably contain surface water in varying degrees. For the most part they are fairly good potable waters. Unfortunately a complete and careful analysis of the inorganic constituents of these waters has so far not been published; neither has a bacteriological analysis of these same waters been undertaken. Our knowledge therefore on these important points is very meagre, and not until it is complete will it be possible to state what, if any, are the constituents by reason of which the water supply exerts the influence which it appears to have upon the frequency of goitre in a given locality.

In the city of Montreal it is singularly rare that a person born and brought up there is afflicted with goitre, while it is quite common in the rural parishes round about. Believing that more definite information might be had on the frequency of goitre among the rural inhabitants, a careful survey has been made of the entire island. This was accomplished by personally interviewing the several physicians who are practicing in the villages and country beyond the limits of the city of Montreal. These interviews brought to light some very interesting facts. It was ascertained that goitre is more or less common throughout the island, being most frequent in females, especially young girls at the age of puberty. It is, however, not uncommon in males. The condition also varies in severity from a simple enlargement of a portion of the thyroid gland to the extreme forms of goitre. These latter cases are far from common. Moreover, it was discovered that there was a variation in the relative frequency of the condition in the several parishes into which the island is divided. This variation in distribution will be better understood after referring to the accompanying map.

It will be observed that the disease is less frequent in the eastern

portions of the island than it is in the western, while it is absent or nearly so from the central parishes of Sault-au-Recollet and St. Laurent. In other words and to be more definite, proceeding eastward from the city of Montreal I found that at Longue Pointe and Pointe aux Trembles 1.5 per cent., or 15 per 1,000 of the population, are afflicted with goitre. At the opposite side of the island in the parish of Riviere des Prairies, the condition is present in 2 per cent. of the inhabitants; while in the parish of St. Leonard lying wholly inland between the parishes of Pointe aux Trembles and Riviere des Prairies, 4 per cent., or 40 per 1,000, of the people are goitrous. Dr. Deschatelets informed me that years ago, when the inhabitants of Pointe aux Trembles depended almost entirely upon wells for their water supply, goitre was quite as prevalent there as in the internal parish of St. Leonard. Afterwards a system of water pipes was introduced in the village of Pointe-aux-Trembles and the water supply was derived from the river St. Lawrence, then goitre rapidly decreased in frequency until it fell to the present ratio of 1.5 per cent. No falling off in frequency has been noted in the same interval in the parish of St. Leonard. In all other respects save the water supply the conditions surrounding the people of both parishes are, and have been, the same.

Passing now to the back of the island, to the parishes of Sault-aux-Recollet and St. Laurent, in the former goitre is almost unknown, while in the latter the ratio is less than one per cent. of the population. This negative district extends for several miles to the westward along the Riviere des Prairies as far as the parish of St. Genevieve. Here again goitre is prevalent in the eastern portion to the extent of 1.5 per cent. of the population becoming rapidly more frequent towards the western confines of the parish. On the south shore of the island in the parish of Cote St. Paul, immediately to the west of the City of Montreal, we find that 3 per cent. of the population are goitrous. Passing up the river, the neighbouring parish of Lachine shows an average ratio of 3.5 per cent.; further up in the parish of Valois this ratio has increased to 4.5 per cent.; and the condition becomes steadily more frequent until, in the parish of St. Annes de Bellevue at the western extremity of the island, it has risen to 7 per cent. of the entire population. Thus, in passing from the east to the west along the south shore of the island, exclusive of the city of Montreal, a gradual increase in ratio has been encountered from 1.5 per cent. to 7 per cent. of the population.

The question naturally arises. What is the explanation of this variation in frequency? Does it bear any relationship to (1) general

configuration of the soil, (2) climatic differences, (3) occupation of inhabitants, (4) mode of life and food supply, (5) depth of wells and habitual water supply? And if so what is the nature of this relationship?

As has been previously noted, the general configuration of the island is the same throughout with the exception of Mount Royal; there are no climatic differences; the inhabitants of the various parishes are engaged in the same pursuits; the mode of life is the same throughout. All are well-fed and dwell in comfortable houses, and nowhere are the people poverty stricken. Nationality is not a factor either, for although many cases occur amongst the French, the condition is proportionately common among the English, Irish, and Scotch settlers. With regard, however, to the relationship of the habitual water supply, an answer cannot be so readily given.

As you are well aware, goitre has from ancient times been considered as a water-borne disease and the prevalent opinion has also been that goitrous water was always richly impregnated with the salts of lime, magnesia, etc. Considerable evidence has accumulated in support of this view. Both men and animals suffering from goitre have been cured by removal from goitrous to non-goitrous regions, while healthy animals have been rendered goitrous by compelling them to drink water from so-called goitrous wells. Ewald⁴ states that in Switzerland by changing the water supply of one of the villages of the Aarer, taking the water from a non-goitrous spring on the other side of the river Aar, the percentage of cases of goitre among the school children was reduced during ten years from 58 to 11 per cent. Similarly in the Island of Montreal we have observed that in the parish of Pointe-aux-Trembles the introduction of a waterworks system supplied with water from the St. Lawrence river resulted in a reduction in the cases of goitre from about 4 per cent. to about 1.5 per cent. Other interesting phenomena observed in the Island of Montreal were in connection with the depth of the wells. Where the wells are deep and the soil chiefly clay, goitre is less prevalent than where the wells are shallow and the soil more sandy. These shallow wells invariably contain surface water only, while the deeper ones, although probably containing more or less surface water, are supplied chiefly from deep water-bearing strata of sand or gravel. The water from now a few of these deeper wells is quite "soft"; some of them supply a water which is highly sulphurous, and from a few a water is obtained having strong saline properties which render it a good substitute for Vichy water. In the western portion of the island the depth of the wells does not seem to have such

a direct bearing upon the frequency of goitre. These facts will be better understood by referring to the following table.

Name of Parish.	Ratio to 1000 of population	Average depth of wells.	General configuration.	Nature of Soil.
Point aux Trembles....	15	20 to 50 ft.	Flat.	Clay loam.
Longue Pointe.....	15	20 to 50 ft.	Flat.	Clay.
St. Leonard.....	40	6 to 10 ft.	Level.	Sandy.
Riviere des Prairies....	20	15 to 20 ft.	Level.	Clay loam.
Sault aux Recollets....	Very rare.	20 to 50 ft.	Flat.	Glacial clay.
St. Laurent.....	Very rare.	6 to 10 ft.	Flat.	Clay. [loam.
Cote St. Paul.....	30	4 to 20 ft.	Flat.	Black mush and sandy
Lachine.....	35	8 to 10 ft.	Flat.	Sandy loam, glacial clay.
Valois.....	45	8 to 12 ft.	Flat.	Sandy loam.
St. Annes.....	70	6 to 15 ft.	Mostly flat.	Sand.
St. Genevieve.....	15	10 to 20 ft.	Flat.	Clay loam.

It is quite evident then that here in the Island of Montreal, where goitre is fairly common, the occurrence of the disease apparently does not depend upon the nationality of the inhabitants nor upon their surroundings or social conditions, but rather seems to be affected by the water used for drinking and culinary purposes. It would seem, also, that the nature of the soil and depth of the wells are factors which must be taken into consideration, and probably play quite as active a part in bringing about the condition of goitre as the geological formation of the underlying rock is said to do. Throughout the Island of Montreal the wells are for the most part what may be termed shallow, and nowhere is it necessary to drill into the underlying rock to obtain water. Hence the water in these wells is properly termed surface water, being the rainfall of the locality after filtration through soil of varying character, depth and porosity. In the parish of Sault-aux-Recollet, where the wells are fairly deep and the soil consists for the most part of clay, apparently deposited during the glacial period and plentifully intermingled with granite boulders, goitre is very rare, corresponding in this respect to the City of Montreal and the immediate shores of the island, whose inhabitants derive their water supply from the Ottawa river. In the neighbouring parish of St. Laurent we find the same sort of clay soil, but here the wells are quite shallow, being only 6 to 10 feet deep, as compared with those in Sault-aux-Recollet which are 20 to 50 feet deep. Goitre is rare here also, in marked contrast with the state of affairs existing in the parish of St. Leonard, where the wells are of about the same depth but where the soil is sandy. In this latter parish the ratio of goitre is 4 per cent. or 40 per thousand. Again when we compare the conditions existing in the parish of St. Annes with those in the parish of St. Laurent the contrast is even more pronounced. In these two parishes there is little

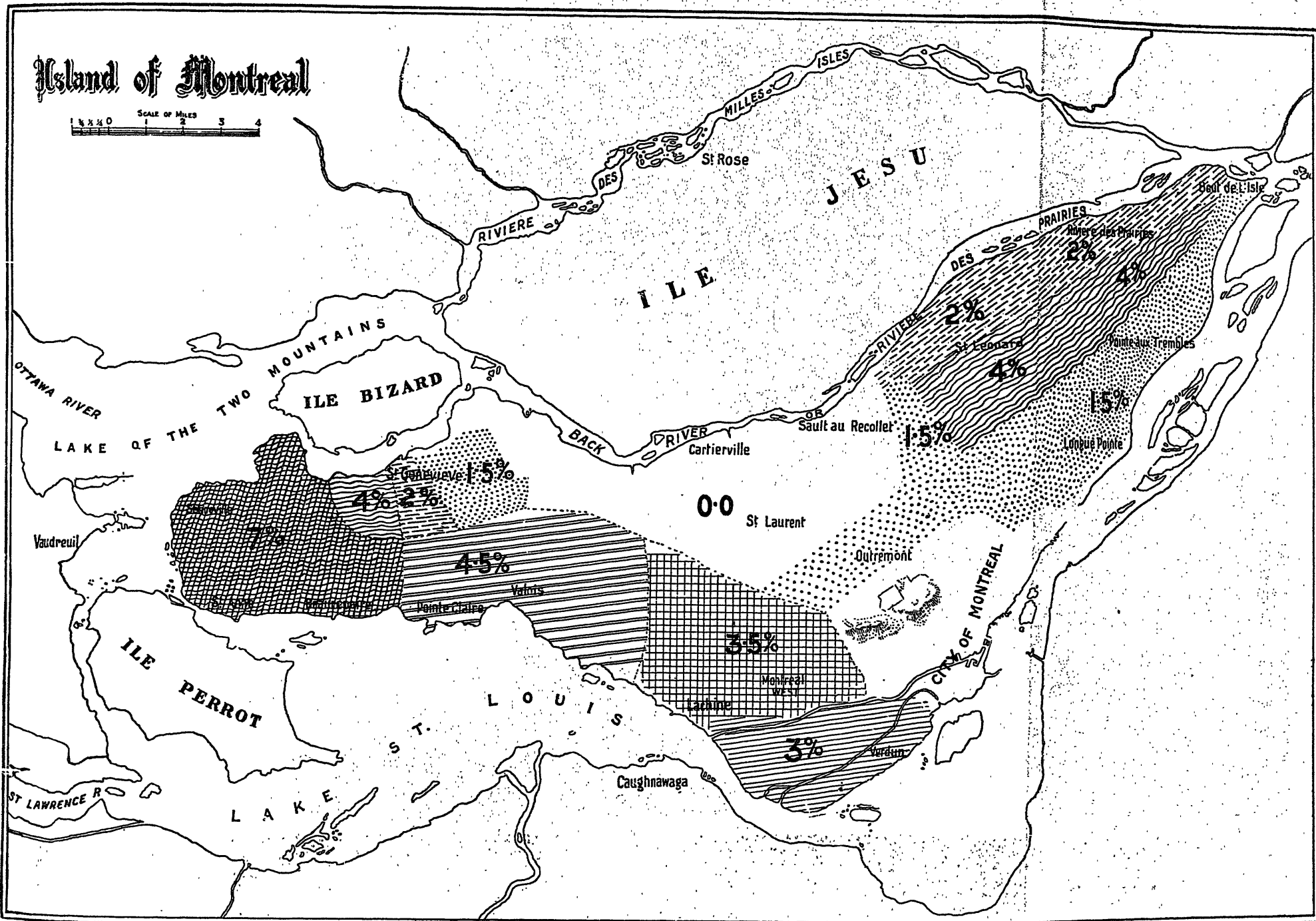
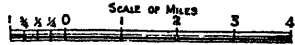
difference in the depth of the wells but the character of the soil differs much. In the former it is glacial clay, in the latter it is of quite a sandy nature. The frequency of goitre in these two parishes also differs widely, for the former it is rare while in the latter 7 per cent. of the people are afflicted with goitre. It is apparent, then, that while the underlying Silurian Limestone formation by affecting the water supply of a locality may have an influence in the frequency of goitre in that district, it is also clear that the depth of the wells and the character of the soil, as to porosity and mineral constituents, have as great, if not a greater, effect. All of these factors must be considered as acting together, and before we will be able to arrive at anything definite regarding the causative agent of goitre, much work must be done. It is absolutely necessary that the water from a considerable number of these wells be subjected to a careful chemical and bacteriological analysis, by way of comparison to ascertain:—(1) Whether the mineral constituents in the water from wells in clay soil differ materially in kind and quantity from those in the water from wells in sandy soil. (2) Whether bacteria are relatively more abundant in the one than in the other. Then having these comparisons at hand, we will be in a better position to state what is the nature of the causative agent of goitre. Is it, as Bircher thought, a mineral constituent derived from certain underlying rocks, or is it, as according to Koeker, of a bacterial or miasmatic nature? If the former view is correct does this substance act directly through the blood upon the thyroid gland, or if the latter, is the disturbance of the nature of a subinfection brought about by the great number of bacteria ingested into the stomach? These are but a few of the main points which remain to be settled before we arrive at a full understanding of the causation of this obscure pathological condition.

It is my intention in the near future to extend this research to other goitrous regions, more especially to Isle Perrot, and also to certain parishes on the mainland in the neighbourhood of Vaudreuil, where goitre is said to be very common, alike in men, women and domestic animals. With regard to the remainder of the Province of Quebec and the Dominion of Canada as a whole, it is well-worth while for the provincial medical societies to take the matter in hand and ascertain the relative frequency of goitre in the several provinces, and define clearly the boundaries of all goitrous regions met with in Canada.

Conclusions:—

(1) Judging from the above observations made on the Island of Montreal, there is a relationship between the habitual water supply of the inhabitants and the prevalence of goitre on the island.

Island of Montreal



(2) Those living in the city of Montreal and along the shores of the island and who drink Ottawa river water are unaffected.

(3) Those living in the country and who are dependent upon wells, relatively shallow, for their water supply, are liable to be affected.

(4) In districts such as Point-aux-Trembles, where formerly the greater number of the inhabitants drank well water and goitre was common, there has been a considerable reduction in the number of cases of goitre since river water has been supplied to the inhabitants.

(5) The drinking of water from shallow wells is not the only factor in causing the disease, as is instanced in the parish of St. Laurent.

(6) A certain relationship would, however, appear to exist between the nature of soil, the shallowness of the wells, and the prevalence of goitre. When the overlying soil is glacial clay although the wells are shallow, goitre does not occur, where, on the other hand, the soil is sandy and porous, as in the parishes of St. Annes and St. Leonard, goitre is very common, although there is considerable variation in the depth of the wells.

(7) So far as the present observation goes the nature of the underlying rock, which from one end of the island to the other is Silurian Limestone, is not the essential factor in the causation of goitre, although we may conclude from the observations made in Switzerland, Norway, and in the Valley of the St. Lawrence, that it is a strong predisposing factor.

To Dr. Adami I desire to extend my thanks for his kindness in supervising and directing this research, also to the several physicians residing in the villages and country parishes, who have so carefully lent their aid and observations.

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SPORADIC CRETINISM IN CANADA.

BY

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In 1900, Professor J. G. Adami instituted a searching enquiry with regard to the existence and distribution of goitre in Canada, in the course of which he obtained some information as to cases of sporadic cretinism, which he has kindly allowed me to use. In response to my enquiries I have brief notes of 13 cases and knowledge of the existence of 27 other cases, in which, for various reasons, I have not been able to obtain notes of any clinical value. The cases are mostly in Quebec, New Brunswick, Nova Scotia, and Newfoundland, have not been included in either of the case lists I shall presently mention, and are exclusive of cases in institutions and asylums. Of the latter, to my personal knowledge, there are possibly 20 more.

The prevalence of sporadic cretinism may be fairly judged from the papers of Dr. William Osler¹ (1897) and Dr. Alexander McPhedran² (1898), the latter of whom deals with Ontario only. Dr. Osler's case list contains 60 cases, Dr. McPhedran's 17. I put forward the 40 cases dealt with here merely as a numerical addition to these publications.

The thirty or more practitioners whose cases I cite are selected from about three hundred or less to whose answers (to Professor Adami) I have had access. There is, of course a margin to be allowed for inaccuracy of diagnosis, but the only cases that ought to be ruled out, are those of chondrodystrophia; since sporadic cretinism is a disease of so inaccurate pathology and of such variable conditions of thyroid gland it practically matters but little if we confound with it case of infantile myxœdema, especially since the recognition of either disease is the signal for the exhibition of the same therapeutic measures. If we allow, then, a fair percentage of error, we yet find that 10 per cent. of a number of rural practitioners from all parts of Canada have, or have recently had, under observation, cases of this disease. There is every reason to expect that a more thorough investigation would reveal a correspondingly large number of cases—a frequency of occurrence which is not generally supposed.

Case I. Female, aged 30. (Dr. Giroux, Isle Vert Que.) Height 4 feet 6 inches. No relatives either cretinous or goitrous; no mental

unsoundness in family. Patient has no affection of the sight but is deaf mute, entirely idiotic and has been partially paralysed for some years past. The thyroid is hypertrophied. There has been no treatment and no improvement, and the case has become worse and worse. (Died shortly ago.)

Case II. B—, male, aged 19 months. (Dr. Angus McKinnon, Guelph, Ont.) Height 30 inches, not so large as the other children of the family when they were his age. Mother and her four sisters are goitrous; father's sister became insane. At age of 8 months he was seen to be a dull, listless child, never appearing to notice anything, never laughing or even attempting to move. The thyroid was apparently absent. Under treatment he has improved both mentally and physically, he sees and notices, but never attempts to speak, laughs and crows when played with, and looks mentally much brighter.

Case III. Male, aged 3½ years, (Dr. McKinnon). Patient was about half the size he ought to have been, and at time treatment was begun he never used his legs, or attempted to speak. At age of three he became moderately active on his legs, looks brighter mentally, and has begun to try to say one or two words. Died in November, 1900, from a growth in the bladder, no autopsy being permitted.

Case IV. V. M. L., aged 6. (Dr. Addison, St. George, Ont.) Height 2 feet 6¾ inches, weight 31½ pounds. Child is short, fat, pale, hair red and coarse, scalp dandruffy, nose flat and upturned, mouth open, the furry tongue projecting beyond a bad set of teeth; a guttural, snoring sound in breathing; abdomen large and prominent, legs and arms stumpy and myxœdematous. There are no goitrous relatives, the mother is distinctly neurotic and of a neurotic family. Thyroid cannot be palpated. Under treatment in less than six months the child grew 4½ inches, the legs, arms and abdomen were all much smaller. During treatment the child has been very irritable sweated a great deal, did not sleep as well as before. Hands and feet are now warm, a contrast to their previous state; walking is much improved and mentality greatly improved.

Case V. Female, aged 28 years. (Dr. Robillard, Thurso, Que.) No cretinous or goitrous relatives. Father became blind at 48. Thyroid gland is absent or so small as to be impalpable. I cannot do better than quote Dr. Robillard's most graphic description of the case, which forms an excellent example of the horror of the unalleviated disease. "She does not stand up, but lies on her back doubled up, knees to chin, in a box two by four and a-half feet, eyes bright, open and piercing, large mouth, enormous teeth, the voice producing a murmur resembling the plaint of a seal. Her sensibility is so obtuse that we cannot

detect if she sees or not. She is mute and apparently deaf. She shows no signs of intelligence whatever; she swallows the food put in her mouth, and the evacuations of her body are made without care. She began to menstruate at eighteen, and has had periods fairly regularly ever since." There has been no treatment and no amelioration.

Case VI. Female, aged 6. (Dr. Casswell, Gagetown, N.B.) No other cases of cretinism, one cousin is goitrous, another epileptic. The sight is unaffected, no deaf mutism, although speech is incoherent. Mental development low; thyroid normal in size. Treatment has been continued now for one year, but there is little change. Myxœdema of moderate degree is present.

Cas VII. Female, aged 18. (Dr. J. F. Macdonald, Hopewell, N.S.) The case is not one of undoubted cretinism, although deficient and variable mentality coexists with an atrophic thyroid. The patient is subject to epileptiform attacks. Sight is poor, but other special senses are good. Treatment has been intermittent, but has produced mental improvement.

Case VIII. Female, aged 58. (Dr. Macdonald.) The condition of myxœdema was very marked, and the dry, hard skin was especially noticeable on upper part of body. Thyroid gland moderately enlarged.

Case IX. Female, aged 40. Five feet four inches in height, weight 130 pounds. Goitrous, mentally imbecile, speech inarticulate, of a melancholic disposition. Never treated.

Case X. Female, aged 38. (Dr. Verdon, Abbotsford, Que.) Four feet ten inches in height, weight 105 pounds, has two sisters goitrous; is imbecile and quick tempered. Special senses seem normal except speech, which is thick and numbling. Thyroid much enlarged; has never been treated.

Case XI. Male, aged 15. (Dr. F. G. Finley, Montreal.) Height 3 feet 11 inches, weight 87 pounds. Mother goitrous. Boy is dull and slow, speaks thickly, is markedly myxœdematous; face typically cretinoid; expression very animal-like, with the characteristic "double eyelids" and the prominent jaw. Face has an expression as if the boy were anxious to understand but could not; hands spade-like; no signs of puberty. On treatment by thyroid extract, after one year had gained 2½ inches and lost three pounds. Much thinner in face, retains the dry, harsh skin and bushy hair. Answers are prompt and intelligent; has learned to write, and can read fairly.

Case XII. Already reported^r by Dr. W. G. Putnam, Yarmouth, N.S. Female, 4 years, height 29 inches, weight 23 pounds. Made no attempts to walk. Typical cretinoid expression, coarse hair, harsh skin, defective mentality. On treatment, in three months, child grew

five inches, and could walk alone. Improvement was continuous and the child became apparently quite normal.

Case XIII. (Reported² by Dr. G. Gordon Campbell, Montreal). Female, aged 5, a typical cretin. Face dull, apathetic, and of the characteristic deformity. Normal thyroid, mentality dull, used only two sounds, interpreted as "pa" and "ma." Under treatment, in one year, she gained four inches, mentally was a different child, and became physically almost normal. Whereas at the beginning of treatment, she had been in the care of a younger sister, after one year the patient had assumed charge of the nurse. This case was the third which had been under the care of the writer.

Of the above thirteen cases it will be seen that where a report was made of the thyroid, it was found atrophied or absent in four, hypertrophied in four, and normal in two. Marked myxœdema is present in only four. No notes are to hand of the condition of the fontanelles or sutures of the head or of the period at which ossification occurred.

Of twenty-seven other cases known to me, I have not been able to secure notes, therefore I merely mention that a total of 38 heretofore unreported cases exist, exclusive of cases in institutions, and that this number occurs among the practices of a rather small percentage of the profession in Canada.

Recent literature on the subject of cretinism shows little else than case reports, and the works of those who have given a special care to the subject, speak for themselves. Very briefly, it may be said that the morbid anatomy reports show a diversity of finding in the condition both of the central nervous system and of the thyroid gland⁴, and even in the presence of such changes as are found, we still require explanation of most of the phenomena of the disease. Careful microscopic study of post-mortem material may show much, and is to be sought. Since the morbid anatomy is obscure, it is not to be wondered at, that the etiology is in the same state. There is doubtless a disturbance of the function of the thyroid gland and a close connection with goitre, which cannot yet be explained, but which doubtless depends upon water-supply, and, it may be, geographic conditions.³ A fair percentage of all sporadic cretins are the offspring of goitrous parents, and many are themselves goitrous. It is therefore in goitrous districts, and in goitrous families, that careful observation of very young children is desirable, so that early treatment may prevent the occurrence of the adult cases that are so dreadful in mental and physical deformity.

For purposes of diagnosis the mere seeing of a single case is of more value than any description, and I know of no better guide to the condition than the series⁵ of photographs which accompanies Dr. Osler's

paper in the Transactions of American Physicians and Surgeons, Vol. IV., 1897. Should this meet the eye of any one unacquainted with the condition, he may be assured that a mental picture of the type of face there represented will be a safeguard against the neglect of any moderately pronounced case.

The treatment of the disease by thyroid extract is so well known that it scarcely requires comment. The maximum does consistent with the well being of the patient must generally be sought, and must be strenuously persevered in. To avoid the ill effects that have been described, the commercial products are safer than the raw gland, which, when kept, is found to undergo very rapid change. The dosage required for young children will be found to vary from one grain upward, and any long-continued lapse of treatment will be found to be detrimental to the patient's cure.

I gladly acknowledge my indebtedness to those gentlemen who have so kindly forwarded notes of their cases.

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- 3, *Vide* Dr. Charlton's article upon Goitre in this number.
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PRESIDENTIAL ADDRESS

BY

W. S. MUIR, M.D., of Truro.

Delivered before the Maritime Medical Association, Halifax, July 4, 1901.

Gentlemen,—This is a task, and a most difficult one. If you would only be satisfied with a paper upon a definite subject it would be much easier for me. Doubtless you do not desire the time of this association to be occupied by the chairman, as no doubt when I was selected to fill the chair you knew perfectly well that no other member of this maritime association could fill it to overflowing. When I look back over the list of distinguished men who have preceded me in this chair, I cannot even begin to thank you for the great compliment you have paid me by electing me president of this association. Gentlemen, it is a great honour, and one that I shall always be proud of. To try to even shadow the position so well and ably filled by such distinguished men as Wm. Bayard, Hon. Dr. Parker, Edward Farrell, James McLeod, D. A. Campbell, P. Conroy, James Christie, W. B. Slayter, R. McNeill and J. W. Daniel, is to me a great undertaking.

What strikes one most in looking over that list of our former presidents is the uncertainty of life. The Great Physician of Souls has, since our last annual meeting, been pleased to call two of our most active members and former presidents to "that rest that remaineth for the worthy departed." I refer to Drs. Edward Farrell, of Halifax, and James McLeod, of Charlottetown. On the first day of the new century, after a prolonged, brave and gallant struggle for life, that good, honest, sympathetic, able and loving man, Edward Farrell, was called to rest. Dr. Farrell's manly, straightforward bearing, his ever bright face, his ready wit, and above all his honesty of purpose, won for him the love and friendship of everyone with whom he came in contact. He was a fluent, clear, witty and most inspiring speaker. As a teacher of clinical surgery he had few equals and no superior in this Dominion of ours. When I say that with the death of Dr. Farrell the right arm of the medical profession of Nova Scotia was cut off, I mean it, as no matter what subject came up, and in what position the doctor was placed, he never sacrificed the profession for his own personal interests and many a time

he was placed politically and socially in a position where a man of less backbone would have yielded, but he was always as true as steel.

They gave him wit—so keen and bright,
 Yet steeped that gift in honey;
 A brave, strong will, well poised for fight,
 A nature warm and sunny;
 A skilful hand, whose lightest touch
 Is filled with help and healing,
 A tender hand, that gives so much
 Of sympathy and feeling;
 A gentle voice, whose charm alone
 Can still the heart's fierce crying
 By reassuring, cheering tone,
 When hope itself was dying.
 A heart, both warm and true as steel,
 Brave, resolute and plastic,
 So strong to bear, so quick to feel,
 So buoyantly elastic.
 With gifts like these from fairyland,
 Rich nature's best apparel,
 They dowered his head, and heart, and hand,
 And called him Edward Farrell.

Just ten days before, Prince Edward Island was called to bear the loss of her best known surgeon, Dr. James McLeod, a most distinguished looking personage, tall, straight and handsome, with a most striking likeness to Bismarck; slow and deliberate in speech and action, most courteous and kindly in manner. To those of us who have had the privilege as well as the pleasure of Dr. McLeod's company, one thing in particular must have left an everlasting impression upon us, that is, his strict professional bearing and abhorrence of quackery in all its forms, both in and out of the profession. Dr. McLeod was in an eminent degree truthful in all his habits, a man of sterling integrity, a bold and earnest advocate of all matters connected with the profession. Gentlemen, we have met together to-day for mutual benefit, and could we not each and all of us benefit ourselves by emulating the witness of these noble men, our former co-workers and past presidents.

We have met to-day for mutual benefit I have just said, still, how very small a gathering when you consider the fact that within the maritime provinces we have, according to Dr. Roddick's figures, 476 medical men in Nova Scotia, 90 in P. E. Island, and 243 in New Brunswick.

Think of that, gentlemen, and then look at the attendance here

to-day. All professions and trades are to-day organized and armed to the teeth except the medical profession, and if these organizations are not needed, and have not accomplished what they were organized for, don't you suppose they would long ago have ceased to exist? One reason and one great reason, for so little interest being taken by the profession at large in the different medical organizations is that there is no pecuniary benefit derived directly from our annual meetings. Men tell us that they cannot leave their work, that the profession is so overcrowded that they fear to leave home. I grant you, gentlemen, that this may be the case in some small circumscribed places, but where is that overcrowding that we have had thrown in our faces every day for the past twenty years? Not at the top of the medical ladder, I can assure you, but at the bottom, and we shall always stick there if we do no get out of ourselves and give what assistance we can to one another. It is a duty that every medical man owes to himself, his family, and his patients, that once a year, at least, he must have a holiday, and what better way can it be spent than with his co-workers in his chosen profession. Don't think for one moment that the public do not sooner or later take stock of this, and comment upon it, and hence indirectly you will reap back some of your pecuniary loss. Why do the great Canadian and American life assurance companies always ask, "What medical societies or associations are you a member of?" They always want up-to-date examiners, and they do not pick up the driftwood, I can assure you. Some will try to convince you that the multiplication of medical societies must of necessity increase the difficulties of closer and greater organization, and hence make it the harder to concentrate our energies for common good. I do not think so. These local societies must do good as feeders; and they also give men more confidence in themselves, and bring what is in a man out. No better example of this can be seen than amongst the politicians of the lower provinces, for have not four-fifths of them been started in the little local temperance lodges? They learn to spout there, of course, becoming politicians afterward. God forbid, gentlemen, that I will or shall advocate such a course for the medical man. Stick to your physic and keep out of politics if you wish to live long and die happy. You will be asked at this meeting to express an opinion as to the necessity of the formation of a Dominion Defence Association, or union, in connection with the Dominion Medical Association for the protection of the characters and interests of its members, to advise and defend or assist in defending members of that association in cases where proceedings involving questions of professional principle or otherwise are brought against them.

Let me quote from the president's (Dr. Bierwirth's) address, delivered

at the annual meeting of the New York State Medical Association, 1900:

"It is a well known fact that suits for malpractice are of almost daily occurrence, and without doubt, more than 90 per cent. are for inadequate cause and for blackmail only. It is too well known among a certain class of individuals, as well as among a certain class of lawyers, that doctors are an easy prey. They are sensitive also as to their reputation, which must always suffer from suits of this kind. They abhor publicity, and are only too glad to compromise to prevent this and save trouble. But what a different state of affairs would exist if every unjust suit for malpractice were defended by our state medical association, and if the people knew that they have to deal with a powerful society instead of a weak individual."

At the present moment Dr. Conerty, of Smith's Falls, Ontario, is fighting for his rights and honour, and by doing so is upholding the honour and dignity of his profession. For the last four years he has been dragged through the courts to defend a suit for malpractice. Many of you know the circumstances of the case as well as I do. It has aroused our sympathy. I use the doctor's name for the reason that no medical man is safe if such a case can be brought against us, and because the doctor need not be ashamed to be the defendant in such a prosecution. The medical profession, however, is not one-sided. We owe the public many duties and obligations, and we should be ever diligent and vigilant for the welfare of the community where we reside. I am afraid, however, that the tendency of the age is towards commercialism. Every action means money, and everything is weighed by the dollar. With apologies to the memory of the late Robert Ingersoll, let me suggest a title for the next president's address: "What shall we do to be saved?" Take almost any country newspaper and read the professional advertisements or cards. What do you see? In many cases pure and simple untruths. Some are to a degree true, but the idea is to bring corn to the advertiser's mill, and not a simple announcement of removal or commencing practice. The most common magnet is "late of the London hospitals," next, "late of the New York or some other post-graduate college. Now some with American degrees actually say late house surgeon, or late assistant surgeon at such and such a hospital in England. How can that be? What is the need of Dr. Roddick's bill if that is the case? Now the traveller, the post-graduate man who has been on the other side on his wedding trip or some excursion, which generally lasts from one to twelve months, fails to bring back an English degree, but is a specialist, and in almost every instance that specialty is chosen to fit the place where he settles. "Diseases of women," after the legitimately

recognized specialties of eye, ear, nose and throat, come first. And why? Chiefly because nobody can contradict the diagnosis, it is secret, and women are so anxious to be gulled. Why do not more men advertise themselves specialists upon skin diseases? They dare not! One man advertises himself, "tumours and cancers" a specialty; another, "diseases of women and children" specialties; another, "special attention given to midwifery and diseases of women." How kind! Do these men who advertise know that to advertise yourself even as a specialist in any branch of medicine or surgery will debar you from membership in the highest medical tribunal in the world, the British Medical Association? In the constitution of the Canadian Medical Association you will find the following:

"It is derogatory to the dignity of the profession to resort to public advertisements, or private cards, or hand bills, inviting the attention of individuals affected with particular diseases, publicly offering advice and medicine to the poor gratis, or promising radical cures; or to publish cases and operations in the daily prints, or suffer such publications to be made, to invite laymen to be present at operations, to boast of cures and remedies, to adduce certificates of skill and success, or to perform any other similar acts. These are the ordinary practices of empirics, and are highly reprehensible in a regular physician. Equally derogatory to professional character is it for a physician to hold a patent for any surgical instrument or medicine, or to dispense a secret nostrum, whether it be the composition or exclusive property of himself or others. For if such nostrum is of real efficacy, any concealment regarding it is inconsistent with professional liberality; and if mystery alone gives it value and importance, such craft implies either disgraceful ignorance or fraudulent avarice."

Gentlemen, I am sorry, yes, pained, to have to draw your attention to this matter, but if we ever wish to gain that respect for our profession that is necessary, we must take this matter into our own hands, as the provincial medical boards, whose duty it should be to look after such humbugging, do not appear anxious to stir up this matter. Another matter of vital importance to every medical man who has any professional connection with the Intercolonial Railway of Canada, is the ignominious manner in which we are treated by the railway and by the I. C. R. Employes' R. and I. Association. Deaf, diseased and maimed men are taken on the railway without a medical examination, and we are supposed to treat these men afterwards for \$2.50 a year, find all medicines and surgical dressings, and pay our full fares on all trains when visiting a railway employe. Then if a poor section-man is ill at an out-of-the-way station, he has to take the nearest doctor as the crow

flies, notwithstanding the fact that a special train may be passing his door several hours before the nearest doctor by the air line could possibly get there. In a few words let me say that the present arrangement, for it is only an arrangement, and not a system of medical attendance upon the Intercolonial Railway of Canada, is a disgrace to modern railroading, and could this society not pass a resolution at this meeting calling the new general superintendent's attention to this fact. I do not think that there is a doctor or man on the railway at this moment who is satisfied with the present state of affairs.

To the profession of Canada by far the most important measure since confederation is without doubt what is known to every medical practitioner in Canada as Dr. Roddick's Bill, a bill which has recently been introduced into the Dominion parliament by Professor T. G. Roddick, M.P. for Montreal. It provides for a central medical council, upon which will be representatives from each of the eight provinces of the Dominion. The homœopaths will also be represented upon the central medical council. Their representatives will be appointed by their own body. This bill also provides for examinations, and for a course of study for five years. The bill was introduced by Dr. Roddick during the last session of the House of Commons of this Dominion, but was withdrawn before the second reading for the reason, chiefly, that several of the universities and two of the provinces asked time to consider some of the details. I can state without fear of contradiction that the majority of the provinces have already practically endorsed the general principle of the bill. Some changes shall also have to be made in deference to the wishes of the larger provinces. The scheme of representation on the council outlined in the bill may have to be changed, so as to give them a fairer share of representation. I have it from the best authority that Dr. Roddick will present his bill early next session, and that a committee composed of all the medical men of the House of Commons, with two or three lawyers, will be formed to receive and hear any grievances or amendments presented by delegates from the various provinces. We must all admire the wonderful amount of skill, tact and pluck that our most distinguished friend and benefactor, Dr. Roddick, has shown in the management of this prodigious undertaking. Like a well-fed child, his scheme gains weight and strength daily without exciting antagonism in any quarter.

In looking over the programme of work that is for our deliberation during this meeting, you will be pleased to note the number of papers upon matters vital to the whole country at large. I refer to the burning question of the hour, tuberculosis. I will not dwell upon this matter, as there are others down upon this programme to speak upon this

mighty subject who are better qualified to do so. The recent tuberculosis conference held at Ottawa has brought this subject before the eyes of the whole Dominion, and if that meeting has done nothing more than setting the public thinking, it has done a vast amount of good. One point worthy of more than a passing thought is, that no matter what tuberculosis conference you attend, no matter what sanatorium you visit, by far the most enthusiastic, zealous and devoted person present is one who is or has been himself a "lunger," or who has had those ever near and dear to him under sanatorium discipline. What better evidence of the absolute necessity of sanatorium treatment and discipline do we require than that?

Take up the White Man's Burden,
 The savage wars of peace;
 Fill full the mouth of famine
 And bid the sickness cease.

When the versatile Kipling penned the "White Man's Burden," I wonder if it ever entered his mind what has made this burden a task? What a pleasure the advance of science would have been had one common tongue or one universal language been continued?

The "Tower of Babel" has had many things said about it, still I do not think that anyone will object to my saying that the diversity of tongues has been a great obstacle to the advance of medical science. Many say that with one common tongue we would lack that patriotic spirit that is absolutely necessary in any nation; others say that a universal language is only of value in commerce, nowadays when competition is so keen, and the demands upon our time so great it is impossible for a man to cultivate a foreign language and become a linguist. Still we must thank Providence for the rapidity with which the English language has increased during the past 100 years, for in 1800 only twenty millions of people spoke English; in 1900, 116 millions. During that time the German language only increased one million, the French 21 millions. As the white man goes south, obeying the command of Scipio, "carrying war into Africa," when our cousins to the south of this Dominion forget the doctrine of James Munro, what do we see? Upon both continents to the south of the Anglo-Saxon and Teuton, disease and pestilence fading before the science of sanitation.

Can any sane man stand up and say that at the present moment smallpox and diphtheria are not under control, that inoculation in typhoid is not worthy of a trial, and that we are not cornering up tuberculosis? Let these anti-vaccinationists read what vaccination has done for Cuba since the blowing up of the Maine. Cuba before the introduc-

tion of Anglo-Saxon rule was the hotbed for smallpox in America, and within three years the ever wide-awake and scientific American has completely stamped that disease out of all the towns. Why the different boards of trade never take up the great question of sanitation in relation to quarantine is astonishing, as sanitation must in time overcome to a great extent all quarantine restrictions.

Gentlemen, I thank you for your kind attention, and let me say that we have come here to-day to consult and confer about the interests of our profession, a profession demanding the profoundest learning, widest research, the most patient and painstaking discrimination; it is the profession of humanity, for all its labors are for the physical amelioration of a suffering race. There is no cry too feeble to catch the ear of the physician; the wail of the new-born babe, the moan of the pain sick sufferer, the gasp of the outcast dying in misery, alike touch a chord in the heart of the noble, humane and philanthropic physician.

CASE OF RUPTURED INTESTINAL TUBAL PREGNANCY, WITH
SEVERE HEMORRHAGE INTO THE ABDOMEN—
OPERATION AND RECOVERY.*

BY

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Mrs. G. F. L., 30 years of age, began to menstruate at 14. Never had any pains, but the flow was profuse. She was married at 18, and her husband died at the end of three years, without her ever having become pregnant.

Immediately after her marriage she had a severe attack of cystitis and pelvic peritonitis, and as her husband had the reputation of having been dissipated before his marriage, his wife's illness was in all probability gonorrhoeal, although his death from consumption renders it possible that it was tubercular. She had several other similar attacks, but milder in form during the three years. After remaining a widow for one year, she married a second time at the age of 22, after which eight years elapsed without her ever having become pregnant, during all of which time her periods recurred with great regularity until two periods ago, when for the first time she missed one period, and again a month later she missed another one. Six weeks from the time she missed the first period, about ten a.m. on the 22nd of March, she was leaning forward in her house, when she felt something break, and she was taken with a terrible pain and such weakness that she had barely time to make a rush for her bed, on which she fell fainting. During these six weeks her breasts swelled and she was troubled with morning sickness, and she believed herself, as indeed she was, pregnant. A neighboring doctor was at once sent for, who gave her a hypodermic of morphine, but as she was much worse that night, he was sent for again, when he gave her something to quiet her nerves, but apparently did not realize the seriousness of her condition. Next morning she told her family that she felt she was dying, and that the doctor did not understand how ill she was, and to send for another doctor.

Dr. Warren was then called, and arrived there at 10 a.m., just twenty-four hours after the fainting spell, and learning that she was supposed

* Read before the Clinical Society of the Montreal Dispensary, April 28, 1901.

to be pregnant after a long period of sterility, and that she had been taken with a sudden pain and a fainting spell, and finding here pulse 160 and her hands and feet cold, he diagnosed at once a case of ruptured tubal pregnancy, and insisted that I should be called in consultation. Unfortunately I did not get the message until nearly 3 o'clock that afternoon, at which hour I was due at another consultation, so that it was exactly 5 o'clock on the afternoon of the second day when I saw her. In addition to the symptoms which were related to me as above, I noticed that her abdomen was quite distended with fluid or semi-fluid material, there being only a little resonance on percussion in the centre of the abdomen, all the rest being dull; and although on examination no solid mass of any kind could be felt, even the tubes and ovaries being apparently normal, as felt by bi-manual palpation, still I had no hesitation in agreeing with Dr. Warren's diagnosis, and I urged that the patient be at once conveyed in an ambulance to the Samaritan hospital for operation. The husband of the patient, however, could not be found before half-past six, and the lady would not leave her home without his permission. Full explanations as to what had to be done and why it had to be done at once were left with several members of the family, with directions as to how she was to be conveyed to the hospital, and eight o'clock was fixed as the hour for the operation. On going to the hospital, however, at that time, the patient had not arrived, and Dr. Warren could not be found, so that nothing could be done but wait, as the patient resided some miles away at the other end of the city. I feared that the reason for her non-appearance was that she had died shortly after my visit, as at that time her pulse was hardly discernable, and her appearance was very unfavorable. However, at half-past seven next morning I received a telephone message saying that she was still alive, and asking whether I was still willing to operate; but though I again urged them to send her at once, in spite of my endeavors it was after nine o'clock before she reached the hospital. In twenty minutes after her arrival, or two days less forty minutes from the rupture, her abdomen was opened, when there was a considerable gush of bright red blood. No time was lost in clearing this away, until the source of the hæmorrhage was found; after trying first one tube and then the other, and finding neither of them ruptured, although the right one was closed and full of liquid, the uterus was drawn up, and then the source of the hæmorrhage was seen to be the rupture of an interstitial tubal pregnancy, occupying an area as large as a gypsy-nut, and situated half-way between the centre of the fundus and the left cornu or the portion of the left tube which passed through the wall of the uterus. This was quickly closed with a double layer

of catgut stitches, the first one being very firmly tied and obliterating the cavity, the tube and the ovary on this side were taken off, but the right ovary was left, and the right tube had a new pavilion made on it so as to give a free passage from the ovary to the uterus; then about a gallon of blood, partly liquid, but including many large clots which had formed under the stomach on the left and under the liver on the right, was removed. As there still remained many small clots among the coils of the intestine and under the folds of the omentum the abdominal cavity was washed out twice with a gallon of sterilised salt solution, after which the water came away pretty clean. The patient before the operation had a temperature of 96 1-2 degrees, but her pulse could not be counted, so two quarts of sterilized salt solution were left in the abdomen, and as soon as she was put back to bed a pint of salt solution was thrown into the rectum, and repeated every two hours all day, with the result that by night she had a distinct pulse of 150 and a temperature of 98. By next morning the pulse had come down to 120 and the temperature had risen to 99; and 48 hours after the operation the pulse and temperature were both 100, after which she made a rapid recovery, being up and walking around her room three weeks later, and returning home in four weeks and a few days.

There are several points of interest about this case; the first is that it is not the first, nor the second, but the fifth case of tubal pregnancy which has been sent to me by Dr. Warren, and the question naturally arises how did he come to have four cases in his practice when many other doctors have never had one, and my answer is, although it may not be the correct one, that it is because he is looking out for these cases; no doubt another doctor might have had this case in his practice—and indeed did have it—without ever having suspected the condition, and when the patient died, as she certainly would have, she would have been registered as a “death from heart failure from ‘Grippe.’”

The second point is that although in some cases death ensues very rapidly after the rupture of the tube or of the uterus, yet in this case hæmorrhage had been going on steadily for 48 hours, and yet the patient was able to bear this serious operation, including much manipulation of the bowels, and still make a rapid recovery. Third, a tube and ovary were left in order that she may have another, and it is to be hoped, a normal pregnancy; although it is not quite certain that this is the wisest course to pursue, owing to the number of cases on record of a second tubal pregnancy occurring in the remaining tube; and fourth, that this is my sixteenth case of tubal pregnancy without a death; they have been reported in groups of twos and threes about the

time they occurred, and in most of the cases the names of the family physicians were given, except in one case the diagnosis was made by one of my fourth year students, on the person of his landlady, who, on his return from my lecture on this subject, and hearing her describe her symptoms, told her that was just what the doctor had been lecturing on that morning, and at once called me to see her. And on operating on her a few hours after at the Western Hospital, a ruptured tubal pregnancy was found.

From this experience I am inclined to take a very favorable view of the prognosis, and it behooves every practitioner to keep the possibility of this condition in mind, for if this were done, I feel confident that my sixteen cases would soon be increased to twice or three times that number.

A CASE OF METASTATIC STREPTOCOCCAL INFECTION.

BY

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In these days of transition in the treatment of disease, when the younger generations are losing faith in the old empirical methods, and when science has but recently awakened and shown us not only the bacterial origin of so many diseases, but also demonstrated what theoretically is the rational treatment, it is perhaps the duty of those who have opportunity to test any of the less frequently used so-called anti-toxins to report any progress made by their patients after such rational treatment has been employed, so that statistics may be formulated the practical and clinical value of what theoretically is absolutely rational, and science has proved to be true. Feeling thus, the writer is desirous of placing before you the record of a patient treated by him while suffering with a metastatic and polymorphous streptococcal infection.

On the 12th May last the writer was called to a youth of 21 years of age who gave the following history:—Three days before, May 9th, he had noticed a couple of red papules surmounted by white heads situated just below the right knee. Being annoyed by the slight irritation they caused he had scratched them with a needle. On the next day, May 10th, the areas surrounding the two pimples were slightly painful, but it was not until May 11th, that he noticed an erythematous blush surrounding the original lesions, and extending up over the superficial lymphatics to the saphenous opening. This condition was so painful, and he was so feverish and unwell, that he felt unable to attend to his ordinary duties. It was not, however, till the afternoon of May 12th that the writer was called in and found the patient to be in a high fever with a temperature ranging about 104° F., and a pulse running in the vicinity of 112. Examination demonstrated the condition already described, namely, an infective dermatitis situated below the right knee and extending over an area of about three or four inches in circumference with an additional lymphangitis extending from the before mentioned lesion to the glands situated over the saphenous opening.

These lesions seemed to improve greatly under the influence of simple general methods and the local application of the ordinary hospital *lotio plumbi subacetatis*, but the writer was disappointed to find a slight swelling, which presented no signs of fluctuation, over the head of the right tibia when the patient was visited on the 14th May. This, how-

* Read before the Clinical Society of the Montreal Dispensary, June 14, 1901.

ever, resolved under the influence of an ice bag, and everything appeared to be getting on nicely, the dermatitis decreasing in extent each day, until May 19th, when another swelling was observed situated over the anterior surface of the ankle joint. This presented no sign of fluctuation and was treated by ordinary simple methods until the next day, when fluctuation being palpable, it was incised and one and one-half drachms of thick pus evacuated. Another development of importance was noticed for the first time on this day, a slight erythematous blush appeared over the left malar eminence. This was diagnosed as an infective dermatitis, a metatasis from the infection already observed on the right lower extremity.

It is interesting to note that this erythematous patch, although being of an erysipelatous appearance, did not present the definite raised border, the œdematous full red appearance of this streptococcal infection, although it was felt that it and its forerunners were certainly the resultants of the pathogenic infection which was due most likely to a variety of streptococcus.

On this, and subsequent days, treatment with antistreptococcal serum was considered as the temperature, apparently of the septic or church steeple variety, often reached and passed 104° F., but the experiences of those who had already tried it were such, and the possibility that the antitoxin employed might prove to be only antidotal to other of the numerous varieties of streptococci, than those which apparently caused this infection, were sufficient to persuade the writer that such treatment was not yet indicated.

On May 21st, the erythema was observed to have slowly advanced to the bridge of the nose in spite of treatment by the constant application of lead lotion, and this continued to advance till the next day, when it seemed to have reached its height, having covered both the right cheek and ear. The disease, and the temperature, which for the past few days had ranged between normal and 104° , seemed to have reached their fastigium, and the crisis was expected when on May 25th the patient complaining of slight pain over the right knee, and examination having demonstrated fluctuation, an incision was made and half a drachm of pus evacuated. May 26th and 27th passed by uneventfully except for the fact that towards the evening of the latter day a very slight erythema was observed over the forehead. On May 28th the erythematous blush on the forehead had spread and increased to a more definite dermatitis and the eyelids became œdematous and red. The temperature on this day reached $104\ 4-5^{\circ}$ at 3 p.m., and the pulse-rate numbered 124. The patient's condition seemed to indicate any treatment that had ever proved efficacious in any case, consequently, at 3.30 p.m., 20cc. of the

antistreptococcal serum of the Pasteur institute was injected subcutaneously in the lumbar region. The injection was painless and was not followed by ill-effects. His evening temperature on this day reached 105° .

May 29th. The patient was generally, but not markedly, improved. His temperature reached one-fifth of a degree higher than on the preceding day, and a second injection of the same amount and serum was used.

May 30th. The patient's condition was greatly improved, the temperature on this day not reaching higher than $102\ 4\text{-}5^{\circ}$. A third injection of a like amount of the same serum was employed.

May 31st. A further improvement was noticed, his maximum temperature on this day being $100\ 2\text{-}5^{\circ}$. A fourth injection of 20cc. of serum was used.

June 1st. When he was visited the temperature had not been over $99\ 1\text{-}5^{\circ}$, but as there was one small area of slight erythema about the size of a ten cent piece it was thought advisable to inject into its borders a solution containing 1-20 of a grain of bichloride of mercury. This, as is often seen with this drug, caused an intense inflammatory reaction, with a slight rise of temperature, but both inflammation and temperature, soon disappeared under the use of an ice bag.

June 3, 4, 5, 6th. The patient's condition was good, the temperature never rose higher than normal.

This case draws attention to two points of interest:—Firstly, it is worthy of note that this patient appears to have been peculiarly susceptible to infection. He has informed the writer that just a year ago he was confined to his bed for some days after being vaccinated, and further, was unable to attend to his ordinary duties for some weeks. Secondly, it is interesting to note the almost immediate fall of temperature and improvement in condition after the use of the antistreptococcal serum, and although this improvement cannot be definitely attributed to the serum, still the result is worthy of note.

In closing, it may be stated, that the clinical diagnosis of a streptococcal infection was verified by cultures taken from the pus of the abscesses opened. These gave cultures showing many streptococci associated with a few staphylococci.

CASE REPORTS.

BY

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Scybalous Masses in the Rectum of an Infant.

On April 24th, 1901, Mrs. G. brought to me her infant, a boy, aged 15 months, complaining that the child screamed with pain every time his bowels were moved.

The child was a little over average size, somewhat anæmic, the muscles rather soft, with a large head and large abdomen. There were no signs of rickets and the abdomen seemed quite soft on examination. The child had been nursed for two weeks, and was then fed on cow's milk, except during the hot months of last summer, when condensed milk was substituted for it. Latterly he had been given bread and porridge and other plain foods with the milk. Shortly before Christmas he had an attack of what the physician in attendance called membranous croup, but had quickly recovered and lost very little weight at the time. The bowels had always been regular, except during this attack, when he had suffered from constipation.

Just after the attack of croup the mother noticed that the child had sudden pains at irregular times and not associated with the movements of the bowels. Since then he had been perfectly well except for the fact that every time he had a motion he screamed with pain, and seemed to dread having his bowels moved, catching hold of her and showing unmistakable signs of fear before each stool. He slept well, was of a most cheerful disposition, had a good appetite, and had a motion of the bowels of a natural colour two or three times a day. She had rarely required to give him a purgative, and had never noticed anything wrong with the stools except on two occasions, four and two days ago respectively, when he had passed a small quantity of blood.

There was no evident cause for the pain made out by external examination, so I asked Dr. Cameron to chloroform the child the following day, expecting to find either a fissure of the rectum or polypus. It was difficult to obtain a good view of the mucous membrane, but nothing more than a slight superficial erosion could be seen. On introducing my finger, however, I found the rectum dilated and filled with a number of hard scybalous masses, eight of which I succeeded in removing with the finger. They were quite hard, rattling on the tray they were

placed upon like stones, of a light yellow colour, faceted somewhat like gall-stones, and the largest one, which was the nearest to the anus, was an inch in diameter. Removal of the hard masses was followed by complete relief of the symptoms.

**Severe Facial Neuralgia Occurring as the First Secondary
Symptom of Syphilis.**

A young, well-nourished girl, nineteen years of age, came to the Out-Patient Department of the Montreal General Hospital on December 6th, 1898, for relief of a severe neuralgia of the right side of the face. She gave the following account of her illness:—The pain had begun three weeks previously, and became progressively worse. It exhibited a remarkable regularity in time of onset, beginning at about three o'clock every afternoon and lasting well on into the early morning hours. During the morning and up to three in the afternoon she was entirely free from it. She had never suffered from neuralgia before.

The patient was slightly anæmic, and examination showed no evidence of any disease in the circulatory or respiratory systems. There was acute tenderness over the nerves at the supra-orbital, infra-orbital and mental foramina on the right side of the face. The nose and throat showed nothing to account for the neuralgia, and the teeth were fairly good. She was given cod liver oil, with small doses of strychnine and powders of acetanilide for the pain. Three weeks later the pain was still severe and small tender ulcers appeared on the mucous membrane of the mouth and pharynx. I did not recognize their nature, but attributed them to the neuralgia, looking on them as probably herpetic in origin.

The treatment failed to give even temporary relief, and it was not until March, 1899, three months after her first visit that the problem was solved, when one day I was asked to see her at her house. I then discovered that she had a well marked eruption of secondary syphilis over the trunk and extremities, with general glandular enlargement and sore throat. She stated that she had had a labial chancre over four months previously and it was still present. Treatment with a grain of grey powder four times a day promptly relieved the neuralgia and caused the rash and ulcers in the mouth to disappear.

The occurrence of severe neuralgia as the first symptom, with the exception of the primary sore, of syphilis, is, I think, worthy of being recorded. Headache or pain in the head distinctly worse at night always suggests syphilis as a possible cause, but the absence of all signs of the disease, when the first examination was made, wrongly led to its exclusion.

Vesical Irritability and Pain following Moderate Doses of Quinine.

J. D., male, aged 30 years, consulted me on February 17th, 1901, for what he called "a bearing-down sensation in the lower part of the abdomen." On questioning him, I found that the uncomfortable feeling he complained of was a sense of weight and pain over the hypogastric region, relieved temporarily by emptying the bladder; and that there was slightly increased frequency of micturition. He had always been in good health with the exception of an attack of grippe seven years before, and was just recovering from a slight attack of the same disease. He attributed his symptoms to the grippe as he had suffered in a similar way after the first attack. He had had a mild attack of gonorrhœa one year after the first attack of grippe.

Enquiry as to how he had been treated, revealed the fact that he had been given quinine on both occasions; he could not say how much during the first attack, but in two days had taken twenty-four grains for the last attack. He remembered distinctly that the physician who treated him for the first attack had told him that he could not find any cause for the symptoms complained of, and he had then consulted a second, but without receiving much benefit, although a most careful examination had been made and his bladder washed out. The condition had gradually improved, and disappeared completely in three or four weeks. He was quite positive that he had never taken any quinine between the two attacks, as he had never had a day's illness.

I think there can be no doubt that this was a case of vesical irritation from quinine, even though the amount taken was not large. It is well known that some persons show a special idiosyncrasy to the action of quinine, most of the cases of severe cutaneous lesions following its administration having been caused by relatively small doses. Then, too, irritation of the urinary tract is recognized as an occasional untoward effect, instances having been recorded in which a condition resembling acute nephritis resulted from moderate doses of quinine.

RETROSPECT OF CURRENT LITERATURE.

Medicine.

UNDER THE CHARGE OF JAMES STEWART.

Early Tuberculosis.

E. L. TRUDEAU. "The Importance of a Recognition of the Significance of early Tuberculosis in its Relation to Treatment." *Medical News*, June 29, 1901.

Trudeau enters a plea for the early diagnosis of tuberculosis. The results obtained in sanatoria have demonstrated that the disease is curable, and curable in direct proportion to the stage at which treatment is applied. Thus, at the Adirondack Cottage Sanitorium, during 1897-'98-'99, of 113 incipient cases, 82, or 72 per cent., were discharged apparently cured.

The diagnosis of incipient tuberculosis often presents many difficulties. Persistent slight cough, with loss of flesh and strength, a slight rise in temperature of one-half to three-quarters of a degree, and considerable lassitude are symptoms, which, even without any appreciable signs on physical examination, point in many cases to incipient tuberculosis, but which are too often disregarded. Too much importance should not be attached to an absence of abnormal physical signs, as all rational symptoms are often present before the disease can be detected by physical examination. Miliary tuberculosis, infection of the deeper portions of the lung or of the glands, may fail to show any abnormal signs. Search for the bacillus should be begun early and persisted in as long as any doubt as to the diagnosis exists. When the bacillus is found there is no appeal from its decision, but its absence from the expectoration is not a conclusive criterion.

In the great majority of cases a consideration of the history of the case and a careful study of the rational symptoms, with a thorough examination of the chest, a microscopic examination of the sputum, aided by a careful X-ray examination where necessary, will enable the physician to make an early diagnosis. If this cannot be done, the tuberculin test frequently leads to a definite conclusion, and either re-

assures the patient or leads to a definite diagnosis with prompt and radical measures of treatment. Although not often required, it is in the detection of incipient cases that its most general usefulness lies. Where any marked degree of fever is present it is less reliable, as the balance of the heat regulating centres in such cases is already disturbed, and the injection may cause fluctuations of temperature which are misleading. In skilful hands its more general application will warn the patient and physician and result in saving many lives.

Trudeau's experience in going over many hundreds of clinical histories leads him to believe that in the majority of cases months or even years are lost before the patient's danger is realized.

Unless the all-important bearing of an early diagnosis in the successful treatment of the disease is more generally realized, the results of open air treatment in many institutions projected or built will be disappointing.

Pancreatitis.

MAYO ROBSON, F.R.C.S. "An Address Delivered before the American Surgical Association. *Brit. Med. Jour.*, May 11, 1901.

The writer points out that obstruction of the lower end of the common bile duct must necessarily lead to obstruction of the pancreatic duct. There is, however, no pathognomonic sign to show that the pancreatic duct is occluded unless it be the extremely rapid loss of weight. Fat necrosis affords an important clue, but can only be detected when the abdomen is opened. Glycosuria, lipuria and fat in the stools occur too seldom to be of much use in diagnosis, although when present they are of great diagnostic value. Direct injury is sometimes a cause of acute pancreatitis and a fatal case is related from a slight blow on the abdomen. It seems probable that in abdominal operations for gall-stones, injuries to the pancreas are not infrequent. Owing to the proximity of the duodenum and the opening of the duct of Wirsung, with the opportunities for infection, it is a matter for surprise that pancreatitis is not more frequent.

The essential cause of pancreatitis is bacterial infection, and as in bacterial infection of the liver, biliary and pancreatic lithiasis, injury, gastro-intestinal catarrh, ulcer and cancer of the stomach, zymotic disease, such as typhoid or influenza, are determining factors, though in some cases pancreatitis has come on suddenly in individuals in robust health. The frequency of gall stones in the causation of pancreatitis was forced on the writer by the frequency with which he found enlargement of the head of the pancreas in operations for cholelithiasis.

Fat Necrosis is a splitting of fat into fatty acids and glycerine, the

latter being absorbed and the former remaining in the cells in combination with calcium salts and forming yellowish-white patches of varying size in the subperitoneal fat, omentum and mesentery. Fat necrosis is found in association with pancreatitis, although also present under other circumstances. Flener and others regard the fat necrosis as due to the escape of the fat splitting ferment from the pancreas to the tissues immediately surrounding it, and thence by contiguity to the adjoining and even distant part of the abdomen and thorax.

Hæmorrhage.—Local hæmorrhage into the pancreas may occur apart from injury or any general hæmorrhagic tendency, and although recovery may ensue, yet such hæmorrhages may lead to death, with symptoms of collapse and dyspnoea, in the course of a few hours. This may occur in good health and without premonitory symptoms. A hæmorrhagic tendency also exists in cancer of the head of the pancreas, and in several cases of pancreatic disease operated on hæmorrhage has been the direct cause of death. As a result of operative experience the writer believes that in jaundice severe and even fatal hæmorrhage is apt to occur when complicated with pancreatic disease. This tendency can be successfully combated by the free administration of calcium chloride. It may be concluded that in pancreatic disease there is a strong tendency to hæmorrhage, a tendency which is much increased by the presence of jaundice.

Pathology of the hæmorrhages.—There is some reason to think that the glycerine set free by the pancreatic fat necrosis may be the cause of the local hæmorrhagic condition in pancreatic disease. Experimentally, glycerine injected into mice, even in minute quantities, produces hæmaturia or hæmoglobinuria, and in the human subject blood has been seen in considerable quantity after the injection of iodoform and glycerine to the uterus in certain cases of tubercular disease of the tubes.

As a diagnostic aid in the recognition of pancreatic disease Camidge has shown that urine in this condition treated with an oxidising agent, and then tested for sugar with phenyl-hydrazine gives a positive result. In cases of catarrhal jaundice and a number of other conditions the test is negative. Although tried in too few cases to warrant any positive statement, this test is well worth further trial. The blood in two cases showed a marked diminution of the blood plates, and whatever the cause it may be connected with the hæmorrhagic tendency.

Treatment of acute pancreatitis.—In the acute infective form the treatment is practically that of an acute peritonitis of the upper abdominal zone. The pain at the onset is usually so intense as to require the administration of morphine, and the collapse indicates stimulation. The symptoms are too indefinite at the onset to warrant surgical inter-

ference, and until the collapse passes off it is unjustifiable. The simulation of intestinal obstruction will probably lead to efforts to secure an evacuation of the bowels to relieve distension. If an exploratory incision establish the diagnosis, a posterior free incision in the costo-vertebral angle will allow the whole organ to be freely examined, and gives free vent to the gangrenous and necrotic tissue.

Subacute pancreatitis is more amenable to treatment, although it is usually attacked only after there is abscess formation. There is, however, no good reason to delay treatment to this stage. Distension, if present, may be combatted by stomach washing and turpentine enemata, or by the administration of calomel. Surgical treatment is conducted on the same lines as in the acute affection.

In chronic pancreatitis the treatment should be by abdominal section and drainage, but in this case the drainage is indirect and through the gall bladder as in cholecystotomy.

Hyperacidity.

H. ILLOWAY. "Hyperacidity." *New York Medical Journal*, May and June, 1901.

This paper is based on a clinical study of 23 cases of gastric hyperacidity. The writer's results bring out the fact strongly that the diagnosis of hyperacidity cannot be made by chemical tests alone. Although cases presenting the clinical features of hyperacidity usually show a larger amount of free acid, yet there are exceptions to this rule. In the normal stomachs examined the total acidity ranged from 46 to 74, and the free hydrochloric acid (estimated by Mintz's method) from .04 to 51, whilst in cases presenting symptoms of hyperacidity the total acidity was from 52 to 120 and hydrochloric acid from 13 to 64. It is obvious from these figures that different stomachs must have a physiological individuality of their own, and that an amount of acid readily tolerated in one case will, even in smaller amount, give rise to symptoms of hyperacidity in another.

The affection may present itself in an acute or chronic form. The writer does not consider "latent hyperacidity" as a morbid condition, as the variations of acid in health are so considerable that no strict line can be drawn between the pathological and physiological amounts.

Patients suffering from hyperacidity usually maintain their nutrition, although frequently of spare habit. The appetite is fair, and in many very good. Even where food has been abstained from for fear of aggravating the trouble, the appetite usually returns after the first good meal, and the experience that no evil results therefrom. Vomiting is rare, and was only present in one of the 23 cases. Acid ejecta are sometimes

seen with gastralgic attacks. They cause a burning sensation in the stomach, and cause a numb feeling in the teeth—a sure sign of free hydrochloric acid.

Pain is a prominent and important feature. It may range from a sense of pressure in the epigastrium to an acute gastralgic attack, being in most cases between the two extremes. It comes on at certain periods of the day, some two to four hours after food, and in the intervals there is comparative freedom. Occasionally violent gastralgic attacks occur either at night or at the regular time after meals and terminate by the acid ejections already referred to. In the 23 cases pain was felt in 13, in early all of a "dull, dead character with a gnawing sensation." It is relieved by taking food, bicarbonate of soda or Vichy water, or even by plain warm water to dilute the acid juice.

Eructations are absent except at the termination of a gastralgic attack, and on this point the writer lays some stress in the diagnosis of the condition.

Tenderness is present over the stomach during the pain, but absent, according to Riegel, in the intervals.

As to the cause of hyperacidity, the writer does not agree with certain other writers that the condition is a neurosis, although there is a neurotic element in some cases. He regards constipation as an important factor, a large proportion of patients presenting this symptom before the onset of gastric trouble, and its correction always gives much relief. Irritants, such as alcohol and rich food are also regarded as factors in its production, whilst nervous influences as seen in hysteria, or neurasthenia, overwork or worry have a minor influence in inducing the condition.

In the treatment, alcohol and tobacco are entirely prohibited, also acid drinks and condiments. Constipation is treated by massage in preference to drugs. The writer believes in nitrogenous food, and not in a carbohydrate diet as is now recommended by some writers. Milk is a valuable adjunct, and is able to take up and bind a large amount of free HCl. Drugs do not play an important part in the treatment, a little Vichy water for the painful sensation is usually all that is required, and it is usually left off as the pain disappears.

F. G. Finley.

Gynaecology.

UNDER THE CHARGE OF WILLIAM GARDNER.

Pelvic Diseases Among the Insane.

HENRY, W. O., M.D., "Insanity in women associated with pelvic disease," *Ann. of Gyn. & Ped.*, February, 1901.

"A large majority of all insane women have some pelvic disturbance as an important, if not a chief, causative factor," and early and radical treatment of those so affected is highly important.

Morel states that the brain is the seat but not always the cause of insanity, and Kohlberger, More Madden, Kraemer, Skene, Rohé and others hold the same views. The latter considers that puerperal insanity, melancholia, and simple mania are the forms of insanity which are chiefly amenable to treatment of diseased pelvic organs.

Many gynaecologists will not operate upon any patient who shows any taint of insanity, as they fear to precipitate an attack of mania, but this is a great error on their part, as the operation is far more likely to cure than aggravate the condition.

In the London, Ontario, Asylum, Hobbs found some pelvic lesion in 188 out of 220 women who were examined. Of these, 173 were operated on, and, as a result, 42 per cent. *recovered* mentally, 24 per cent. *improved* mentally, 2 per cent. died, and only 32 per cent. remained mentally the same. None were made worse by the operation.

Dr. Henry appends a list of some sixteen cases in which he operated with excellent results. He considers that gynaecologists who operate upon the insane would get better results if they were not so conservative.

Malignant Disease of the Uterus.

KNOTT, VAN BUREN, M.D., "Sarcoma of the Uterus," *Annals of Surgery*, February, 1901.

The writer studied reports of 118 cases of uterine sarcoma which had been reported during the last ten years. He divides the disease into three groups; viz., (a) that arising in the mucous membrane, (b) in the parenchyma, and (c) in the cervix.

Those arising in the mucosa were supposed to be the most common, but it is difficult to determine the exact site of origin, as those springing from the parenchyma are apt to grow downwards towards the

uterine cavity. Circumscribed sarcoma of the mucosa are very rare, and did not occur once in the 118 cases. These may readily be mistaken for polypi, as they have similar characteristics.

When sarcomata of the uterine parenchyma are circumscribed, as is usually the case, they closely resemble intra-mural fibroids, but these have a distinct capsule, whereas the sarcomata have not. So great is the resemblance between these two forms that tumours, supposed to be fibromata, have been removed, but have recurred, and closer investigation showed them to be sarcomata.

Of all sarcomata, that originating in the chorionic villi is the most malignant, and therefore its early diagnosis and prompt and thorough removal are highly important. Fortunately, it is the most rare form of this affection. In any case, where persistent uterine hæmorrhage continues after pregnancy in spite of repeated curettings, and where the uterus continues to enlarge, it is necessary to decide whether or not the uterus is the seat of deciduoma malignum.

Cancer of the Female Genitals.

KYNOCH, PROF. CAMPBELL. "Primary Carcinoma of the Female Urethra." *Brit. Med. Jour.*, May 18th, 1901.

The urethra, both in man and woman, is very rarely affected with cancer. This is especially the case when the growth is primary, but holds good to a very large extent when the disease spreads from neighbouring parts, that of the cervix much more often spreading to the bladder than to the urethra, the patient usually dying before the latter is reached. In 311 cases of uterine cancer Gusserow found that the urethra was affected 56 times and the bladder 128 times. Many cases of cancer affecting the tissues around the urethra are mistaken for primary urethral growths, as the latter are not seen in time to differentiate between the two forms without very careful investigation.

Urethral cancer may be found at all ages, but is especially liable to occur after the menopause.

Melchiorj classifies urethral cancer as follows:—(1) Only affecting the lower half of the urethra, (2) that involving the neck of the bladder and the pelvic fascia, (3) when extending to the symphysis and surrounding parts. Early recognition is important as regards prognosis, but this is, as a rule, unfavourable.

Vesico-Vaginal Fistulæ.

MCGANNON, M. C., M.D. "Vesico-vaginal Fistulæ." *Am. Gyn. & Obstet. Journal*, May, 1901.

In 1845, Dr. Marion Sims wrote that "a fistula in the bladder—big or little—is absolutely incurable," but, fortunately for womankind;

he immediately set about his investigations, which resulted in his famous successes.

The essentials for success in operating for the relief of this condition are a knowledge of the anatomy of the part, proper denudation and adjustment of the surfaces to be united, and absence of any tension upon the line of sutures. The recognition of the anterior vaginal wall and posterior wall of the bladder was the cause of many of the earlier failures of vesico-vaginal operations.

In the case reported by the writer, the recto-vaginal septum was divided half way up to the cervico-vaginal septum, the anterior wall of the bladder was intact as was also that of the vagina up to the junction of bladder and urethra. Above this, the anterior wall of the vagina and base of the bladder up to the cervix were gone, and the opening gaped from one side of the vagina to the other.

When operating, the bladder wall was dissected from all of its attachments for some distance, and its edges united by fine catgut. The entire vesical opening was thus closed, after which the vaginal mucosa was drawn over this raw surface as far as possible, silk-worm gut sutures being used. One ureter still opened into the vagina. Thirty days after the first operation a ureteral catheter being passed into the ureter through the urethra, a channel was made from the ureter to the urethra by means of a strip of vaginal mucosa. This was completely successful, and a few days later the recto-vaginal septum was repaired.

F. A. L. Lockhart.

Reviews and Notices of Books.

A PRACTICAL TREATISE ON MEDICAL DIAGNOSIS. By JOHN H. MÜSSER, M.D., Professor of Clinical Medicine in the University of Pennsylvania, etc., etc. Fourth Edition, Revised and Enlarged. Lea Brothers & Co., Philadelphia and New York, 1900. Price,

The rapid sale of the third edition of this valuable work soon exhausted the supply, and the author took advantage of the demand for a new edition to thoroughly revise the book. While there is not much increase in the number of pages, we note many small alterations, all of which we think are in the direction of improvement. Thus, for example, he now places Raynaud's disease and the following descriptions of pathological conditions under the heading "skin" instead of "fingers," as in the former edition. In many parts a rearrangement has been made of the paragraphs, so as to make the more important points more prominent.

A paragraph on lymphatism has been introduced, and attention drawn to the liability to sudden death in the subjects of this condition.

There is noticeable improvement, too, in many of the coloured plates. This is especially marked in those of blood conditions, which were not up to the standard in the older editions. The new plates of pernicious anæmia and of the forms of leukæmia are excellent representations of the stained blood smears. Addison's disease is also depicted by a new and better plate.

Many of the diagrams used in the section on Diseases of the Lungs and Pleura have been replaced by simpler and more explanatory ones, and the same is true of the diagrams illustrating the valvular lesions of the heart.

A plate by Wichmann showing the relation of the segments of the spinal cord to the sensory areas has been introduced in the present volume, and the author has added a table, modified from those of several other writers, of the spinal segments involved in motor innervation and reflex functions.

That this is the most practical of all published works on medical diagnosis in the English language is, we think, now admitted by all. While its large size, over 1,100 pages, makes it a ponderous volume to recommend to students, we do not see how any part of it could be omitted without destroying much of its value, and for the practitioner, who desires to keep abreast with the increase of knowledge on methods of diagnosis, it fills every want. We have much pleasure in again recommending it.

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KOCII AND TUBERCULOSIS.

Once more Koch commands the attention of the medical world with the somewhat startling statement that he finds, as the result of his investigations, such a difference between the bacilli of human and of bovine tuberculosis that, in his opinion, the latter may be practically disregarded as a source of human infection. This opinion he founds: 1st. Upon carefully conducted experiments which show that cattle and swine may be inoculated with the bacilli of human tuberculosis with impunity; and, 2nd. Upon the comparative rarity of primary intestinal tuberculosis in mankind. Both these foundations, at the Congress, met with strong criticism, and will require careful investigation.

The fact that human tubercle bacilli appear to be comparatively innocuous to cattle by no means proves the converse. As Lord Lister said, in proposing a vote of thanks to the lecturer, the bacilli of tuberculosis may to some extent resemble the virus of smallpox, which we know is so extremely difficult to inoculate into cattle that until recently it has been regarded as distinct from that of cow-pox. Now we feel sure they are the same, for Copeman has shown that if the virus of smallpox be passed through the monkey there is then no difficulty in

inoculating the cow with the virus thus modified. Although, however, this difficulty of inoculating the cow with unmodified human virus exists, the converse does not hold true, for there is no difficulty in inoculating the human system with vaccine virus. That infection of man by bovine tuberculosis is not impossible is proven by the numerous cases reported in which accidental inoculation with bovine tubercle has infected the human subject.

The second statement of Koch that primary intestinal tuberculosis due to infection by bovine tubercle bacilli is extremely rare, although in opposition to the statement of many English pathologists, is in close agreement with the conclusions arrived at by many continental and American investigators. Koch, in his address, quotes the post-mortem records of the Charity Hospital, in Berlin, where only ten cases of primary tuberculosis occurred in five years, and Biedert's statistics, who, in 3,104 post-mortem examinations of tuberculous children observed only 16 cases of primary tuberculosis of the intestine. In comparison with these we would call attention to Northrup's series of 91 autopsies at the New York Foundling Asylum, in 88 of which the primary seat of infection was in the bronchial lymph nodes, and in only three did it appear to be through the intestinal tract. More recently, Comby, of Paris, stated that out of 211 autopsies in children under two years of age, 28 were tuberculous, and in every one of these 28 the portal of infection was through the respiratory tract. It is to be remembered that primary infection through the alimentary tract does not warrant the assumption that the infection was necessarily derived from bovine sources through food; it is quite as likely that the infection may have been due to some contamination of food by the widely diffused bacilli of human tuberculosis.

These views of Koch met with strong opposition, not only from English physicians, but also from many French, German and American physicians, who feel convinced that we have reasonable grounds for regarding tuberculous cows' milk as distinctly dangerous to human beings; and it was the common sentiment of the Congress that all the available resources of science should be directed to the prosecution of experiments tending toward the proof or disproof of this latest statement of Koch's. All physicians, however, will emphatically endorse the statement made by Koch that the main source of the infection of tuberculosis is the sputum of tuberculous patients, and that measures directed to combat the spread of this dire disease must aim chiefly at the prevention of the dangers arising from its diffusion. To this end Koch advises obligatory notification of all classes of consumption, enforcing on the patient and the public generally the necessity for the

disinfection and destruction of infected sputum, and the disinfection of houses in which consumptive patients have resided. To further these ends he recommends the establishment of sanatoria, not only for the cure, but for the education of those in the earlier stages, and special hospitals for those in the later stages of the disease. To the furtherance of these most important measures we desire to render all the assistance in our power.

POISONING BY MOONSEED BERRIES.

In a recent number of the *Medical Record*, there is reported a case of poisoning in Sharon, Pa., by the fruit of the common moonseed. Three boys who had eaten the berries developed symptoms which led to the suspicion of strychnine poisoning, the cases ending fatally. In the investigation which followed they were found to have eaten the fruit of the *Menispermum Canadense*, a climbing plant whose leaves closely resemble in shape the leaves of the common English ivy, but are much thinner and lighter green, and not evergreen. The fruit which consists of black berries covered with a fine bloom, is not unlike the wild frost grapes, for which it is often mistaken by children. The rhizome and rootlets of the plant form the officinal *Menispermum* of the U.S. Pharmacopœia, which was introduced some years ago as a substitute for sarsaparilla.

The moonseed is quite common along the banks of rivers in this province and from its rapid growth and white flowers in loose panicles, is not uncommonly grown as an ornamental and shade vine about the verandahs and outhouses of summer residences. So far as we have been able to discover, attention has not previously been drawn to the poisonous properties of the berries. The fact that the berries in this climate do not ripen until late in autumn may account for the absence of cases of poisoning in this neighbourhood, the majority of summer residents return to town before the berries ripen. It is well, however, that the public should recognise the poisonous nature of the plant.

The United States Consul-General at Vienna in a recent report to the State Department, furnishes some interesting information regarding the sale of secret nostrums in Austria. We reproduce from the *Medical News* portions of his report from which it will be seen that the great Republic has yet something to learn from "the effete monarchies of Europe."

"The sale of 'arcana' or secret remedies has always been strictly forbidden in this monarchy. Trade in such medicines and advertisements of the same are under strict surveillance of the law. Further, those medicinal preparations of which the prescriptions are not open to in-

spection by physicians, or in the prescription of which the substance of the medicinal ingredients cannot be definitely recognized as to kind and quantity, may not be kept for sale in apothecaries. Only those manufactures may be considered as pharmaceutical specialties that contain drugs acknowledged to be medicinal remedies, as, for instance, balsam copaiba, oleum santali, and the like.

“Every new medicinal preparation intended for use by the public must be reported to the authorities, and its sale may not be begun until said authorities have found no reason to prohibit the same. Prescriptions of foreign medicines must be accompanied by precise directions for their preparation from the foreign manufacturer, and be provided with his signature and business stamp. Altogether excluded are cosmetics that by their labels, wrappers, and advertisements are affirmed to be efficacious in the removal of personal blemishes—impure skin, freckles, liver spots, and baldness—and are, therefore, qualified as remedies.

“The regulations in Austria in regard to the advertisement of patent medicines are likewise strict. All laudatory notices in local publications of cures and remedies coming from abroad constitute a transgression of the trade laws, and, under certain circumstances, foundation for complaint of unlicensed medical practice.”

Consul Hossfeld of Trieste transmits, under date of July 12th, a report covering the same information. He adds:

“The Austrian law also undertakes to regulate the prices to be charged for patent medicines, for it provides that whenever the reasonableness of the price of such a remedy is questioned, it shall be rated on the basis of the official tariff promulgated in the pharmacopœia Austriaca.

“Those of our manufacturing chemists who are disposed to take the Austrian public or sanitary authorities into their confidence will probably not find it very difficult to obtain the necessary permission for the sale of their products, but I doubt whether any business which they may do in this country will ever prove a source of great profit to them.”

DEATH OF AN EMINENT FOREIGN PROFESSOR.

Joseph Fodor, M.D., Professor of Hygiene at the University of Budapest, has recently died. He was born in 1843, studied under Pettenkofer at Munich, and later under Baron Liebig. Dr. Fodor was, after his master Pettenkofer, the best known of the European sanitarians, and did much toward rendering Budapest the healthy and beautiful city it now is. He was a man of many gifts, and was for some time joint editor of the medical journal *Orvosi Hetilap*.

Proceedings of the McGill Medical Society of
Undergraduates.

SURGERY OF GASTRIC DISEASES.

BY

J. W. McNEIL.

The Surgery of the Stomach, for disease or other conditions, did not exist as such previous to 1875. The stomach was of course occasionally wounded and recoveries did occur, as evidenced by such cases as St. Martin, the French Canadian, who was such a contributor unconsciously to that branch of physiology as well as surgery. Prof. Keen says, "The operation of gastrotomy and gastro-cæsarean section is as old as the Christian era., but these operations were only performed when the surgeon was driven to it, and in almost every case with a fatal result. It is indeed only in the last 25 years that this department of surgery has been revolutionized.

Where the surgeon stood by with folded arms, content only to smooth out the last few hours of the unfortunate patient by the inevitable morphia with the occasional administration of its consort, whiskey; now the most radical operations are undertaken, not only with that extreme boldness which characterizes the profession of the present day, but with a success which, if it were not for our familiarity with the same, we would consider little short of a miracle. Imagine Gentlemen, one of the surgeons at our hospitals (our professors) standing by and refusing to operate for the perforation of a gastric ulcer! With our knowledge of the subject, we would consider it a crime. Yet this was precisely the state of affairs 25 years ago.

Now what are the factors which have made operation on the abdominal viscera a possibility? They are three:—

1st. Anæsthesia. 2nd. Antiseptics. 3rd. Experiments on the lower animals. Every one will agree that without the former two, the thought of such extensive operations would be the wildest day-dream. Since their introduction the surgeon has no fear of cutting down upon this important organ.

In 1875, two German authorities resected the intestines of 35 dogs, 29 recovered and in the following year Hussenhien resected 7.

The knowledge gained by these operations was, 1st. That the surfaces of the stomach unite by first intention; 2nd. That there is no digestion of the mucous membrane in the neighbourhood of the wound.

The experiments proved also that the operations did not interfere with the motor or secretory functions of the organ.

The question of sutures and knotting, and the best form to use and other minor details were also settled.

In 1877, Czerney for the first time sutured the intestine and had a good result. In the same year, Billroth did the first gastrorrhaphy and total resection of the bowel.

In 1878 and 1879 were performed the first resections of the stomach for tumor. Then followed gastro-enterostomy and pyloroplasty and partial gastrectomy and a perfect storm of operations in and about the stomach. Even the entire removal of the organ was performed with a fair measure of success. Indeed, the time is near at hand according to Jenner, when the stomach shall be opened for diagnostic purposes.

Now what are the operations and the results of the operations which are performed for diseases of the stomach?

The operation of gastrolisis, or the removal of the stomach from its attachments to surrounding organs, must of necessity be limited, especially when this accident is the result of a perforating ulcer. But when the adhesions are from other causes as gallstones and peritonitis, though exceedingly difficult to diagnose, good results have been reported from the operation.

In the *Indian Medical Journal* of '98, a case is reported of a woman, aged 44 who had persistent daily vomiting for 18 years, at irregular intervals. In six weeks, under the treatment of a physician she lost 16 pounds and was in danger of dying from starvation. The stomach was opened and found attached to the bowel below. The adhesions were separated and the patient made a good recovery. So that this condition is of some surgical importance.

Gastrotomy.—The term was first used for any opening of the abdomen, now it is confined entirely to the operation of opening of the stomach. The indications for the operation are:—1. To remove foreign bodies. 2. In case of stricture of cesophagus. 3. For ulcer of the stomach. 4. For exploration.

The operation for removal of foreign bodies was first performed in 1602, but it was not till 1880, that it was undertaken with any degree of security. It is perhaps interesting to note the amount and variety of articles found in the stomach.

Fennel reports a case in the *Lancet* of '98 of a man who came to the London hospital and who had taken from his stomach 192 nails, (most $2\frac{1}{2}$ in. long) buttons, hair, etc., the total weight being 1 lb. $9\frac{1}{2}$ oz. Another case reported by Meisenbach, in which he found 187 staples, screws, horse-shoe nails, wire nails, cartridges, knife blades, besides an ounce of glass, the total weight removed being 1 lb 11 oz.

The operations for stricture of œsophagus are two:—(1). By immediate dilatation or repeated dilatation and little at a time. (2). Temporary gastric fistula till dilatation is complete.

Gastrostomy is the establishing of a permanent opening into the stomach. No operation is perhaps more important to the general practitioner. For we do not know the time when we will be compelled to do this operation from stress of circumstances.

The indications for the operation are:—(1) Non-malignant stricture of œsophagus and cardiac orifice of the stomach, and such conditions as tumors pressing on the œsophagus at this point. 2. Malignant disease of œsophagus and cardiac end of the stomach.

The operation was first performed in 1849 according to the literature, and up to 1875, 28 cases had been operated upon with a mortality of a 100 per cent.

It was first performed successfully by Sydney Jones in 1875. A great deal of opposition existed among surgeons owing to the high mortality, it being considered useless and dangerous. Since 1884, the mortality has been steadily decreasing. Of the first 163 cases operated upon 133 died, giving a mortality of 81 per cent. Gross, in the *Transactions of the American Surgical Association* of '84 shows a mortality of 29 per cent. Later in 1891, Pomers in *International Journal of Surgery*, a mortality of 27 per cent. for malignant and 18 per cent. for non-malignant cases.

Mikulicz, in 10 gastrostomies for non-malignant stricture of œsophagus did not lose a case, and of 34 malignant strictures 7 died, showing a mortality of 20 per cent.

There is perhaps little doubt that the high percentage of mortality was in part owing to the delay in performing the operation and when it was performed as a last resort rather than to relieve an obstructive condition. Mikulicz says, according to Meyers, that the operation should be performed when it is difficult to pass fluids and semi-solids and when the patient shows a steady decrease in weight.

I will not here even attempt to name the number of operations and modifications but will content myself with two, the first one performed and the one adopted in this University.

The first was performed by an incision parallel to the lower border of the ribs. The stomach was sutured to the abdominal wall and time allowed for the formation of adhesions; then an opening was made directly into the stomach. The difficulty of such an operation is quite apparent, the opening being large and unprotected a considerable regurgitation of stomach contents took place producing excoriation of the surrounding skin and rendering the subsequent history of the patient most-miserable.

The operation performed here is a vertical incision made to the left of the median line. The stomach is drawn well forward and sutured to the anterior wall, an incision is then made into the stomach and a small rubber catheter introduced well into the cavity.

A purse string suture is introduced and tied tightly around the catheter. The catheter is now pressed in further causing the stomach wall to invert, and another row of purse string sutures followed by a second inversion is followed by a third row of sutures; so we have a tube leading into the stomach lined by peritoneum. The catheter is taken out in a few days and patient fed by a silver one.

Gastro-enterostomy.—The anastomosis of the stomach to some part of the intestine.

The conditions which call for this operation are malignant and non-malignant stricture of pylorus, and ulcer of the stomach; and Dr. Keen says that a fourth may yet be accepted, namely, obstinate digestive trouble which has not yielded to purely medical treatment.

The result of operation for stricture of the pylorus is most encouraging. One case operated on last year by Dr. Garrow, I think is worthy of notice.

The patient, a woman of 39 years, suffered with gastric symptoms for 10 years. She was unable to retain any food and became extremely emaciated only weighing 92 lbs. when her former weight was 135 to 140 lbs. When she was operated on a firm mass was found at the pylorus which was not defined, at least not demonstrated, if I remember rightly. A gastro-enterostomy was performed, using Murphy's button; she made an uninterrupted recovery and in three weeks had gained 16 lbs. When she left the hospital she appeared to be enjoying perfect health. The success of such an operation is beyond dispute.

The operation was first performed by Walfler in 1831.

Between '81 and '85, thirty-five cases operated on showed a mortality of 61 per cent. Since that time the mortality has been decreasing, the non-malignant cases going as low as 7 or even 4 per cent, the malignant cases remaining about the same.

However it is probable that the progress of the disease and not the operation, is in many cases the cause of the fatal termination. In the earlier operations, a factor responsible for a certain proportion of deaths, was that the first presenting portion of intestine, was attached to the stomach wall.

In some cases, the point of anastomosis was near the ilio-caecal valve, leaving a large portion of the intestine, excluded, thus diminishing digestion and absorption, the patient ultimately dying of inanition. Now the circumstances have changed. The surgeon does not satisfy himself with any portion of the intestine presenting, but endeavours to obtain that portion of intestine lying 20-30 inches below the pylorus.

The difficulty of obtaining the proper loop is quite apparent. Most surgeons direct one to seize the first portion presenting and hand it to the assistant. If in following the bowel down it will become thin; if up, it will be thickened and pale.

Another difficulty, and one of very great importance is the union of the intestine to the stomach wall without regard to peristalsis. The result being that the food instead of going into the distal portion of the intestine, goes into the proximal, producing what might be called a vicious cycle.

If the pylorus were not thoroughly closed, it would produce vomiting, of bile, food and pancreatic fluid. If it were not patent then the outcome would be extreme dilatation of this portion of the intestine. To overcome this, several operations have been devised. Von Hacker recommends puckering the proximal end by transverse suture through the lumen of the intestine.

Launenstein's is perhaps the best, but requires considerable time; he advises the anastomosis of the proximal and distal portions of the intestines. In addition to these difficulties another arose. As the intestine was passed over the transverse colon the weight often produced obstruction with disastrous results.

In order to overcome this, a hole was made in the mesocolon, but as the intestine was yet attached to the anterior wall of the stomach, gangrene was liable to occur from destruction to the blood vessels. For this reason Von Hacker in 1875, adopted the method of posterior gastro-enterostomy, thus avoiding the danger of gangrene and at the same time facilitating the passage of food into the intestine, more especially when the patient is in the dorsal position. He prevents a hernia occurring by suturing the margins of the vent made in the mesocolon to the stomach wall.

Pyloroplasty.:—The enlarging of the pyloric orifice was first per-

formed by Heineke, and almost as soon by Mikulicz, the two men after whom the operation is most frequently called.

The indications calling for such an operation are essentially non-malignant stricture, from any cause. The advantages of the operation in favorable cases, where the pylorus is not greatly thickened, over such an operation as gastro-enterostomy are fairly evident, but where there is a gradual thickening, it would hardly be so permanently successful as an artificial opening.

The operation may be (1) Heineke-Mikulicz, where the pylorus is incised transversely and sewed up vertically, or (2) Loreta's, where an opening is made into the stomach and the pylorus forcibly dilated. This has two objections. The liability to recurrence and it carries a high mortality of 31 per cent.

Pylorotomy, or the excision of the pylorus, need only be performed for one condition, that is malignant disease of this portion of the organ as any other can be overcome more easily by gastro-enterostomy or pyloroplasty, but cases must necessarily arise as in other parts of the body, where the surgeon is in doubt as to the true nature of the tumor with which he has to deal (in fact his diagnosis should be made before any tumor is noticed) in such cases especially in persons advanced in years. Pylorotomy is the only safeguard; for malignant disease no other operation can be compared to it. Gastro-enterostomy is only palliative and pyloroplasty an impossibility.

Hemmetts says, "To operate.—(1) When there is dilatation of the stomach. 2. When cachexia exists. 3. When there is absence of hydrochloric and excess of lactic acid. 4. When there is hæmatemesis.

The success of the operation depends upon the size of the tumor and the extent to which the glands are involved. It must of necessity depend on an early diagnosis, for if the glands about the stomach and between the stomach and colon are involved, it does not require a great knowledge of surgery to see that removing the pylorus and leaving the glands would be a perfectly useless as well as a dangerous operation and for this reason. I quote the words of Dr. Fenwick of Edinburgh, who says:—

It may be accepted as a practical rule that the occurrence of chronic gastritis without definite cause in a person over 40 should always be regarded with suspicion. If at the end of a month, the complaint has not yielded to careful treatment or if the patient continues to lose flesh and suffers from pain and vomiting after the use of fresh milk, while the stomach contains food in the early morning without free hydrochloric acid, the presence of malignant disease may be regarded as a certainty, even without the presence of a tumor."

The two methods of operation most frequently performed are Kocker's resection, followed by an end to end anastomosis (gastro-gastrostomy) with or without a Murphy button. Or Czerney performs a gastro-enterostomy, and after resection closes the cut ends.

The other operations which are performed for diseases of the stomach, and they are many, I have not even attempted to touch upon, as I feel I could not do them even the limited justice which these have received and because I have already overtaxed your patience and imposed upon your good nature more than is my prerogative.

TRAUMATIC SYNOVITIS.

BY

J. T. HOPE, '01.

It is a well known fact among the laity that morphine relieves pain, but very few among them understand its physiology or physiological action, or methods of administration, and so the medical man who in dealing with a case does not fully understand how, why and when to apply his treatment is little better off than his lay brother. I shall therefore in this paper try to deal with a few points in a thorough manner rather than with a mass of theoretical matter which is not capable of practical application.

This subject was suggested to me partly by seeing the large number of cases at the Montreal General Hospital during the icy period of last winter: partly by the recollection of a case which occurred during my High School Course, of which I was fortunate enough to be a witness to the injury, the method of treatment—in so far as I remember it—and the ultimate recovery. It was as follows:—One day at school one of my companions, a lad of 18 or 20, while practising the “hitch kick” gave his knee a severe twist, the whole weight of his body being upon the foot which landed first upon the floor. The pain was sudden and intense, the knee began to swell rapidly; it was with difficulty he was able to walk home where he at once took to bed. Next day on seeing him I found the knee hot, painful and swollen to such an extent that the knee-cap was floating. A physician was called in, the injured member was put at rest, the joint freely painted with iodine, then bandaged and after some three weeks in bed the patient was able to be about again, though the joint remained weak for some time necessitating his wearing an elastic stocking for about two years, after which period the joint was as strong as before.

This is a fairly typical case and serves to illustrate how a trifling injury to a joint like the knee, may incapacitate the unfortunate victim of it for a long period.

In looking over the reports of such cases for the past two years at the General and Royal Victoria Hospitals, I find the predisposing causes in nearly 50 per cent. of cases to be due to blows on or about the joint, over 30 per cent. to be due to falls and the remainder to twists, strains, etc.

In acute cases the symptoms are those of an ordinary inflammation,

viz.:—pain, swelling, heat, redness at times, together with loss of function of the joint; fever may or may not be present.

The pain sets in at once, or, within a short time after the injury: It is increased by motion of the joint, by pressure upon it, by a dependent position of the limb, and is frequently worse at night. In the early stage it is due to a hyperæmia of the synovial membrane resulting from a vaso-motor paralysis of its smaller vessels as a result of the injury, later to the distension of the surrounding tissues and structures about the joint.

The heat present is due to the passage of a greater amount of blood in the vessels of the parts, to the exudation of serum from those vessels and to hyper-secretion of synovial fluid from the lining membrane itself.

The distension forces the joint to assume the position of greatest ease, hence we find it relaxed and somewhat flexed. If the effusion is great, fluctuation is detected; bulging takes place where the capsule is thin, therefore in the elbow we look for it on either side of the triceps tendon, in the knee about the patellar ligament, or, above the patella if the quadriceps bursa communicates with the joint. Frequently the patella is floated up from the condyles and "rides." The circumference of the knee-joint may exceed that of its fellow by two or more inches (according to the reports of the Royal Victoria Hospital.) Such a joint laid open would show an increase in the amount of synovial fluid which might be found normal, thinned by effused serum, or turbid by admixture with leucocytes and lymph in the more advanced cases, and dark colored if blood was effused. The membrane would be found swollen and congested; the capsule and other parts vascular and discolored; the cartilage alone retaining its normal clear white color.

With proper care such a joint becomes less hot and painful as the inflammation is arrested; the tissues become less vascular the excess of fluid is absorbed and the joint recovers its normal appearance and function.

The first step in the treatment is rest. Rest for the affected part to promote its recovery and rest for the system in general to modify vascular excitement and so limit effusion.

The latter we can reinforce by constitutional treatment. In strong and healthy subjects a saline purge will lower blood pressure and clean the system of toxic material, which might lower the vitality of the tissues and render the affected part more liable to disease, while its weakening effect may assist in reconciling the patient to his surroundings and make him take more kindly to the necessary confinement, sick diet, etc.

In weakened and debilitated subjects on the other hand, stimulants and tonics are indicated, and should the pain be sufficient to prevent rest and sleep, anodynes may be given with advantage. The joint is immobilized by splints or by sandbags and a cradle is placed over it to keep away the bed-clothes. Most surgeons place the limb in the position of comfort (semi-flexion). Others in severe cases, place it in the most useful position should ankylosis occur. Having placed the limb at rest, the next step is to check the inflammation and relieve the pain. Of all agents the best and most easily applied is cold. Heat also relieves the pain but does not so readily check effusion but rather promotes it. Cold is applied preferably in the dry form until the inflammation subsides. The part is covered with a layer or two of flannel, then a rubber bag or a bladder filled with ice, or, a Leiter's coil (cold water) is placed over the part. Cold constricts the vessels, assists absorption and relieves pain. It is not well borne by the old or very feeble. Wet cupping, leeches, etc., are also useful at this stage, but are not so satisfactory.

If cold is not available, the pain may be relieved by hot fomentations. Flannels are wrung out of hot water, a few drops (15 or 20) of turpentine or other rubefacient placed upon them: the joint is enveloped and the whole covered with oiled silk, or waxed paper. When cool it is removed and another put on. In the absence of a better remedy I have found hot fomentations of ordinary vinegar and water do very well.

Having relieved the pain and checked the inflammatory process, which may take a day or two, the next step is to promote absorption of the effusion. The means at hand are compression, counter-irritants, massage, the douche, and intermittent heat. The first three are those usually employed, either singly or combined. Compression greatly promotes absorption and is found to give the best results. It is applied by adhesive plaster, a rubber bandage, or, by plaster of Paris direct.

In the knee-joint, (which is the one affected in about 90 per cent. of cases), the joint is carefully covered with a thick layer of cotton batting for 6 inches above and below. The popliteal space is padded so as to cover the ham-string tendons. Strips of rubber or adhesive plaster are then placed over this, beginning 4 or 5 inches below and overlapping each strip by about one-third till the same distance above is reached, the ends of each strip are brought together or overlapped behind; in this way pressure as firmly as can be borne is made over the swelling. Over all place a muslin bandage. When the swelling goes down apply more on top, or better, remove and apply a fresh one. Plaster of Paris, as ordinarily applied, also gives excellent results. Of astringents, counter-irritants, etc., Lead and Opium, Iodine, Ichthyol

and Mercurials all have their advocates. Tinct. Opii and Liq. Plumbi Subacetatis, drachm each to a pint of water is the strength usually employed. It may be applied cold or hot. In the former flannels are wrung out of the cold solution and laid over the affected part. It may also be applied warm and covered with rubber or oiled silk. It may be combined with pressure as directed above.

IODINE:—Tinct. of iodine diluted with equal parts of alcohol is the strength preferred. It is best painted over the affected part with a camel's hair brush or with a feather. One or more coats may be applied but if used too frequently is apt to vesicate. For children it should be diluted 1 in 4. Should it cause too much pain, relief may be given by applying cloths soaked in cold water or cold milk.

ICHTHYOL:—The ointment of ichthyol, 50 per cent. for adults 25 per cent. for children, may be rubbed on the joint two or three times a day. It has the disadvantage of possessing a highly disagreeable odor.

MERCURY:—Blue ointment spread on lint and thus applied is also efficacious. It also is apt to vesicate a tender skin.

Scott's dressing, emp. ammon. hydrag. combines medication with pressure and is extensively used in hospital practice with satisfactory results.

Massage has many advocates. The general belief among members of the profession is that it is too much neglected. Possibly the skill and labor required in carrying it out taxes the ordinary physician's time too much. It is especially good in the chronic stage, when the pain and tenderness have subsided somewhat, but the joint is still weak and the fluid unabsorbed. One eminent physician reports the cure of six chronic cases which were massaged for 15 to 25 minutes daily.

Blisters, in the later stages, have also proved of value. They have the disadvantage of leaving an abraded surface which has afterwards to be healed. Applied for short intervals every day or two to different aspects of the joint, and supplemented by pressure, they sometimes do well. Cleanse the part thoroughly before applying them. Should they vesicate, drain off the fluid and assist healing by zinc ointment.

The actual cautery has been used with good results: the ordinary hot iron or the Paquelin cautery may be used. Heat the instrument to a dull red and draw it quickly in parallel lines about one inch apart, avoiding all bony prominences. These lines may be supplemented by others at right angles. Apply compresses wet with sterile cold water, or some other mild aseptic lotion.

In spite of such heroic measures, some cases still resist treatment in

skilled hand, as the following one from the Montreal General Hospital reports shows.

E. T. aet. 21, occupation "Ballet Dancer" received a blow on her knee which set up a synovitis, was treated by Drs. Shepherd and Molson for two months. Nov. 5th, admitted to hospital. Nov. 8th, Joint cauterized. Nov. 20th, Scott's dressing applied. Dec. 6th, blistered with cantharides. Dec. 7th, blistered with cantharides followed by zinc ointment. Dec. 11th, cauterized under ether. Dec. 18th canth. plaster. Jan. 17th, students report says "knee is more painful, more swollen and stiffer than before." Jan. 20th, patient discharged.

Having exhausted the usual remedies at hand, the next step is to aspirate and draw off the superabundant fluid. This should be done before the capsule and ligaments have become over-stretched or the synovial membrane too altered by adhesions, villous growths or organized lymph. It must be done under most thorough aseptic care. Enter the needle where the capsule is thin, draw off the fluid, seal with collodion and gauze, then immobilize the joint. The fluid withdrawn is usually normal, but it may be flocculent or dark and blood-stained. It may be copious.

In one case at the Montreal General, it amounted to 12 oz. from the knee joint. After aspiration, should fluid again return, it is usually in diminished quantity and is readily reabsorbed. When the affection is of long standing and the condition of "Hydrops Articulii" is established, some surgeons get excellent results by aspiration, irrigation of the joint by sterilized water followed by the injection of a 2 or 3 per cent. solution of carbolic acid and immobilization. This should not be done while any inflammation exists. Should immobilization too long continued, end in ankylosis and massage, passive motion, etc., fail to restore the function of the joint, break up the adhesions under ether. After recovery most joints require support for some time. This may be done by keeping it securely bandaged, or better, by the use of an elastic stocking. The patient's health must also be looked after.

Should infection take place, as indicated by rigors, high body temperature with pain, redness and marked œdema of the joint, free incision and drainage with antiseptic washes must be carried out. Such joints recover their function completely if ulceration and organization has not gone on too far. Among the reports examined at both hospitals no such case occurred. The following facts which I have gleaned from them may be of interest. The time which elapsed from the injury till the patient had to lay up varied from a few minutes to three weeks or more. Time spent in hospital from 3 to 75 days, average 31 days. The number of recurrences were fairly numerous. The severity of the injury was no index to the prognosis; cases showing most severe

symptoms often recovered speedily; some in which the injury was slight and the symptoms sub-acute ran a most chronic course.

Exposure to cold and over-use may set up an inflammation identical with that caused by injury, but such could scarcely be looked upon as of traumatic origin.

In conclusion, a synovitis in itself is not an affection dangerous to life, yet occurring, as it mostly does, among those engaged in the active pursuits of life, its results are all the more keenly felt and the possibility of its maiming his patient for life should stimulate the physician to do all in his power to bring it to the best possible termination.

RELATION OF ENVIRONMENT TO EVOLUTION.

BY

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Evolution may be briefly defined as the derivation, or gradual development of the higher and more complex forms of life from simpler and more homogeneous ones.

There are two great theories of the origin of life, one, that each distinct and separate group of plants and animals came into being in obedience to the will of a great "First Cause," was independently created, the other that all forms of being which at present exist, are derived or descended from one or a few pre-existing or primordial forms in harmony with the principles of heredity and variability. This latter is in short the theory of organic evolution and it is into this theory that I propose to enquire for a few moments this evening, not for the purpose of proving its truth or otherwise, for that I confess is a task far beyond my ability, but to see if possible what part environment has played in the production of the many animals we see around us, so different and yet, as evolutionists would tell us, of a common ancestry.

Of the modern school of thought Charles Darwin is, without doubt, one of the greatest exponents. Let us look for a few moments at the grounds upon which he based his beliefs and into the theory he lays before us.

The marked likeness which exists between entire large groups of animals becomes even more marked if traced backward to their ancestors: the still more marked similarity which shows itself during the embryonic life of those different groups; the study of fossils and the discovery in these of a succession of related forms which would seem to serve as the links necessary to complete the chain of evidence; the study of domesticated animals which led him to believe that it was impossible for all the different races to have sprung from distinct wild stocks; these and many other facts are the foundation stone upon which Charles Darwin based his theory. According to him the two great factors in evolution are heredity and variability. It is well known and universally admitted that like tends to produce like. Further, if one group of beings differs from its fellows in some particular, it tends to transmit this peculiarity to its offspring. Still more would this be the case if the group in question mated with another group which possessed the same peculiarity. The particular feature would tend to be handed down in even more marked degree. This is taken advant-

age of by breeders of various domestic animals and works changes almost incredible. Is such a selection going on in Nature? Darwin would say, yes. Every being, which during its existence produces one or more of its kind, must during some period undergo destruction; otherwise on the theory of geometrical progression its numbers would very quickly become too great for the means of support. Hence, as more individuals are produced than can possibly survive, there is a struggle for existence, one individual with another, and with its surroundings and conditions, that is with its environment.

That animal survives which is best fitted for the conditions under which it is forced to live.

Variations take place in domestic animals which man by methodical selection uses to obtain new races. It cannot be thought improbable that variations also take place in Nature and under natural conditions. Among many of these one would probably occur which would give the individual possessing it an advantage over his rivals, and in the struggle for existence he would have the best chance of surviving. This peculiarity would be transmitted to his progeny and would give them a better chance for continued existence. Life is a constant struggle with environment and those whose characteristics fit them best to bear the exigencies of that environment will be the most likely to survive. This is the theory of natural selection or of the survival of the fittest. It does not state that natural selection tends to produce variability but only to the preservation of the variations which arise and are beneficial to the being under the existing conditions of life.

If, as before stated, men can, by taking advantage of any variability which appears in domestic animals, produce such great changes, should not the process of natural selection accomplish infinitely greater results? Man, by methodical selection, can act only upon external and visible characters; Nature chooses only those characters which are useful to the being in question. She can act on every internal organ and upon even the most minute shade of constitutional difference, and in a struggle for existence so intense the most minute advantage—the most minute difference may turn the balance in favor of the individual possessing it, again, man can act at most upon a few generations while Nature acts for ages.

What part does this natural selection play in the production of new forms? Take for example one species of animal in a confined area. All animals possessing an advantage, or varying in the right direction will tend to be preserved. If this area be large, its several districts will certainly present different conditions of life, the surrounding conditions, the environment, in the different areas will differ, and only those suited to different regions will survive. Thus we will have several

varieties produced. The largeness of the area as regards environment plays a more important part than the isolation of the different races. But one may object that these varieties do not differ from one another as widely as do species. True, but varieties are species only in the process of formation, or as Darwin calls them, incipient species. How then does the lesser difference between varieties become augmented into the greater difference which exists between species? We have, say, three varieties of the same species modified by variability, or adaptation to environment, and if these multiply naturally and at their natural rate, they must necessarily migrate, come into relation with new conditions come into new environment which will tend to still further increase the varieties and the differences between them. When one considers that the process goes on through ages, it can easily be understood how a new species might arise. The more diversified the modifications the antecedents acquire, due to variability and environment, the more places will the progeny be able to occupy. The multiplication and divergence in character will go on, the modified descendents will multiply and take the place of earlier and less improved branches, and ultimately we get a new and well defined species.

We thus see that in this theory of evolution there are two factors, the nature of the organism itself and the nature of its surroundings. The different varieties have arisen from the co-adaptation of life to its environment, the different species from this co-adaptation continued through countless ages.

But the question arises, is this variability due merely to the chance occurrence in an individual of a species of a peculiarity which is merely by chance favorable to its continued excellence? Does this variation arise haphazard, and are those which are useful transmitted to the descendents producing varieties and ultimately species; or does environment tend to modify the individual? According to Darwin, environment might be said to occupy a passive function, as it were culling off those who were unable to bear its privations, and allowing those who by chance were fitted with a variation which was favorable to continue to live. It of course cannot be doubted that the struggle for existence is universal and that the fittest survive, but later authorities have held that Darwin paid too much attention to this principle and attempted to explain too much by it. He scarcely, if at all, attempted to explain variation, and failed to see deeper facts underlying it. He regarded variations as spontaneous, that is, that it was not possible to assign them to any definite cause. Recognising this difficulty a later school of evolutionists has been founded by Lanarh. They attempt to explain variations by importing consciousness which they regard as a fundamental property of all protoplasm, and they state that this con-

consciousness determines the direction which the activity of the cell shall take. For example, hunger leads to migration which changes the environment. This directly influences the individual and causes a certain number of changes, but the greater number are attributed by them to the use or disuse of parts, the results of which they claim is inherited. Environment is by them thus made to occupy a secondary place, and consciousness and peculiarities arising during life are claimed to be the great controlling factors. This Weismann denies:—He believes that what the individual becomes is determined by the ovum itself and that any variations which show themselves must arise from variation in the ovum itself. Brooks combines the two theories, those of Darwin and Weismann.

The sum up then, if we are to accept the theory of Darwin, environment exercises as it were a passive function in evolution. The origin of species is due to variations very minute, which arising spontaneously give to the individuals possessing them an advantage over its rivals in the struggle for existence: this going on through countless ages gives rise to species.

Later writers, Cope, Lamarh, institute consciousness and the use and disuse of parts of the great controlling factors giving environment but a secondary place. Brook gives environment more prominence, attributing to its influence changes in the gemmules constituting the ovum, and according to the theory of Weismann, thus modifying the individual springing from the ovum. What then are we to conclude. It is a big question and I think I cannot do better than quote Professor Mills. "In viewing heredity and modification it is impossible to get a true insight without taking into consideration both original natural tendencies of living matter and the influence of environment, and so far as our experience goes, life is impossible apart from the influence of its surroundings." He concludes that the various authorities are right in concluding that evolution is universal.

Stable equilibrium is an idea incompatible with our fundamental conception of life. Altered function implies altered molecular action, which sometimes leads to appreciable structural change. From our conception of the nature of living matter it naturally follows that variation should be greatest, as has been observed, under the greatest alterations in the surroundings.