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CANADA

MEDICAL JOURNAL.

ORIGINAL COMMUNICATIONS.

An Address upon the "Progress of Medical Science," read before the New Brunswick Medical Society. By WILLIAM BAYARD, M.D., Edinburgh, President of the Society, &c., &c.

GENTLEMEN.—The By-Laws of our Society direct that the president shall be elected annually; the rule is a good one, placing, as it does, the "honourable situation" into the hands of those who gave it, perhaps to be bestowed upon a more worthy member: and my term of office having expired, I must this evening call upon you to select another in my stead.

In retiring from the chair in which you have so kindly placed me, I would do injustice to my feelings, did I not avail myself of this opportunity to thank you for the courtesy that has been universally exhibited towards me, and let me add, that our meetings and debates have been conducted in a spirit of fraternity and kindness highly pleasing to reflect upon; illustrating the fact that associations like this tend to cultivate the heart, as well as the head, and to promote professional good will, and genuine brotherhood among their constituent members.

That the study of medicine is vastly promoted by such associations must be acknowledged. For the stimulus of mind upon mind, invigorates and sharpens the intellectual faculties, and produces a kind of intellectual contagion stimulating members to exertion. Our mutual intercourse, criticisms, and discussions, form "at once a school and an ordeal," teaching us to become more rigid observers of the medical phenomena occurring in our practice, more careful in our classification of these phenomena, and more perfect in our deductions from them.

Few of us leave this room without having heard some new professional fact, or idea, calculated to arrest our attention, and perhaps destined to give us a new and increased interest in some particular disease. And we are justified in assuming that the progress made in the healing art during the present century, may be attributed, in a great measure, to the stimulating and regulating influence of medical association.

Most of us have heard it broadly asserted that the healing art has remained comparatively stationary during the present century, while other departments of science and art have, during the same period, advanced with great rapidity.

It is true the marvellous applications of steam are creations of the present century. Watt and others have taught mankind to subdue and harness that "docile monster" to different kinds of machinery. By the steamboat we are safely wafted from shore to shore independant of wind or tide, and with the swift rush of the "iron horse" we are conveyed from place to place with the speed of the bird. It is also within the memory of most of us, that a greater feat has been achieved; the Electric Telegraph, that "railway of the mind," has annihilated space, and enabled us, instantly, to whisper our very thoughts from one extremity of the world to the other. And the "science of chemistry has taught the artist to convert that sun himself into a matchless painter," who, with wonderful rapidity, can elaborate the most difficult portraits and complex landscapes, with a degree of perfection unattainable by the human hand.

Yet it may be confidently maintained, that during the period in which these brilliant discoveries have been taking place, medicine has advanced in various directions and forms, by strides as marked and as great as those belonging to any other department of art.

To prove this statement let me endeavour to recall to your recollections some of the *principal* advances and changes that have been produced during the present century. Time will not permit, even were I able to discuss in detail, however briefly, the alterations that have occurred in some of the branches of medical study. As for example, in chemistry, a science, the very language of which has become revolutionized under the guidance of the atomic theory. Physiology has greatly improved, and is daily gaining additions to its domain. And anatomy itself has advanced in modern days, as is evidenced by the discovery that almost all, if not all the component elements and tissues of the human body, and of the bodies of other organized beings, do either consist, or have originally consisted, of nucleated cells.

I need not tell you that *Pathological Anatomy* was known and in some degree appreciated in olden times. But it is within the present century, that, by its light, the nature of diseases previously all but unknown have been explained, such as Bright's disease, morbus Addisonii endocarditis, ramollisement of the brain, phlebitis, œdema glottidis, emphysema of the lungs &c., &c. It has enabled us to separate into specific diseases, affections formerly confounded together; as, for instance, the

different diseases of the heart, various kinds of tumours, inflammatory affections of the lungs, pleurisy, pneumonia and bronchitis, &c., &c., and it has corrected our ideas respecting the nature of some maladies, by teaching us, for example, that delirium tremens is not to be confounded with inflammation of the brain and treated as such; that hydrocephalus, which was formerly recognised as pure dropsy, is the result of inflammatory or acute tubercular disease; that gangrena senilis is caused by obstruction and arterial inflammation, and not the result of weakness; and that cirrhosis should not be confounded with pleurisy. It has also taught us that in hysterical subjects, affections strangely resembling destructive disease of the synovial membrane of the joints, may occur, without the existence of such disease; and it has enlarged our knowledge of the causes and consequences of pyæmia. By it we have recently learned that the parasites infesting some of the brute creation used as the food of man, when taken into the human stomach alive, will produce a parasite of a different character, namely the tape-worm. For example, the bladder-worms growing between the fibres of the lean flesh of a measly pig constitute a preparatory stage of the common human tape-worm, the "tœnia solium," and in systematic zoology are described under the name of cysticerci cellulosœ, when eaten by man, are transformed into tape-worms. It is stated by Küchenmeister that on the 24th of November, 1859, he gave a prisoner 20 measles, and 20 more on the 18th of January 1860, in sandwiches made with sausage. The prisoner was executed on March 31st, 1860, that is, four months after the first, and two months and a half after the second eating of the measles. At the post-mortem examination 19 tape-worms, 11 of them 5 feet long, were found in the small intestines. If the meat containing the parasite is thoroughly well salted or cooked, no injurious consequences will result from eating it.

The microscope has changed and corrected our ideas respecting certain maladies, by proving the vegetable or cryptogamic structure of various eruptions upon the cutaneous and mucous surfaces of the body. It has revealed to us affections, the existence of which was previously unknown, as leucocythæmia, sarcinæ ventriculi, &c. It enables us to ascertain the malignant character of certain tumours and discharges. By it we learn that most of the entozoa found in the interior of the human system, enter it in the form of ova, along with our food and drink, thereby enabling us to modify our sanitary system, and it has greatly enlarged and will doubtless continue to enlarge our knowledge respecting the different morbid states of the urinary secretions. Indeed

the microscope in the hands of the modern practitioner, answers in a moment questions unanswerable without it.

The department of *Pathological Chemistry* has advanced much within the present century. It is advancing daily, and a herculean amount of work and information may be expected from it. We have reason to believe that if we knew the Pathological Chemistry of the blood and fluids as well as we know the pathological anatomy of the solids of the body, then medicine as a science and an art would make advances of the greatest moment.

Pathological chemistry and pathological anatomy together, enabled Dr. Bright to establish the great importance of albumen in the urine, as connected often, though not always, with organic changes in the kidney, but always indicating change in the pathological chemistry of the blood itself. And the recent researches of Dr. Richardson and others, have established that in very many inflammatory diseases, the fibrine of the blood is increased in quantity, and that the change of the fibrine from a fluid to a solid state is caused by increment of heat. Pathological chemistry has also proved to us that the fibrine in the blood is increased in cholera, while it is decreased in malarial and typhus fevers. And recent experiments have demonstrated the fact that the white corpuscles escape from the blood-vessels in inflammation.

A higher and more refined organic chemistry may yet enable us to detect the presence of special toxicological or morbid states of the blood, as producing the characteristic inflammations of the skin in eruptive diseases, puerperal and other fevers. May it not be a blood poison which gives rise to the numerous local, serous and other inflammations so often observed in patients suffering under albuminuria, and by it that vexed question may be settled, as to whether rheumatic fever is due to a *materies morbi*, and whether such *materies morbi* is lactic or acetic acid; and a higher chemistry may perhaps enable us to neutralize these pathological poisons in the system, or eject them from it.

The recent beautiful theory of Liebreich suggesting the adoption of the hydrate of chloral as a therapeutic agent, when he says that "the hydrate treated with an alkali is resolved into chloroform and a formate. The blood being an alkaline fluid, therefore when the hydrate is introduced into the organism, every particle of it will consume the surrounding quantity of alkali, and the decomposition will be completed only after the required amount of alkali has been furnished by the blood. Immediately a minimum quantity of chloroform is formed, and passes to the first place of action, viz., the ganglionic cells of the cerebrum. The action with the increase of chloroform in the blood extends to

the ganglia of the spinal cord, lastly, it extends to the ganglia cells of the heart. The researches of Dr. Richardson, based upon the suggestion of Liibreich, and the practical experience of the medical profession respecting its use, illustrate what may be expected from a higher pathological chemistry.

When we contrast medical practice at the present day with what it was sixty years ago, it must be acknowledged that the modern practitioner is greatly assisted by the late improvements in the means of *physical diagnosis*. By it he endeavours to discover during life, that which was formerly revealed only by the scalpel after death.

A *perfect* diagnosis cannot be arrived at, till we have an exhaustive pathology—for without a knowledge of what is *possible* in disease, diagnosis must be defective. Moreover, that which might be considered a pathological fact to-day, by changing circumstances may be proved erroneous to-morrow. Therefore, in the present state of our knowledge, we must be guided by the *probable* in disease. That experience which is able to anticipate causes, and from causes their effects, often enables the practitioner, as by prophetic insight, to diagnosticate conditions which neither direct physical examination nor the most systematic arrangement of symptoms would explain.

But, as already stated, modern invention and research have greatly contributed towards determining the true nature, and consequently in fixing more accurately the true treatment in different diseases; as, for example, Laennec and a host of subsequent observers have taught us how to map out the condition of internal parts, the action of which we hear, but cannot see. Czermak and others, by the application of optical instruments, have exposed to view organs of the body before inscrutable; the pharynx, the vocal cords, the trachea, the vagina, the uterus, the bladder, &c.; so that many of the hidden causes of disease are no longer a matter of conjecture, but of sight and demonstration.

The ingenuity of Helmholtz has disclosed the secrets of the eye; and it is not asserting too much to say that the *ophthalmoscope* has done more to increase our knowledge of diseases of that organ than has been accomplished during a century by all other means; and that the oculist can point to brilliant triumphs over diseases hitherto deemed incurable; and he is not now obliged to class a number of deep-seated diseases of the eye under the head of amaurosis—to which the remark of Walther is so applicable—"a condition where the patient sees nothing, and the doctor also—nothing." The opthalmoscope also teaches us that some states of the eye are pathognomonic of suspected conditions of other parts of the body.

The *Sphygmograph* of "Marey" has so supplemented the sense of touch that the wave phenomena of the pulse and heart are registered, by which we can fathom the secrets of the circulatory apparatus.

The *thermometer* has been brought to our aid with good practical results illustrating the temperature in different diseases.

And the *test tube* ably assists us in diagnosticating morbid conditions of the urine, &c.

Materia medica has greatly improved during the present century. Many new medicines have been added to the Pharmacopœia, and some have properly been expunged from it. The modern discovery of the active principles in our vegetable medicines under the form of the alkaloids, as quinine, morphia, salicine, atropine, &c., &c., has given the practitioner of the present day the means of exhibiting some of the most powerful and useful medicines in a concentrated form; not in the shape of large powders and nauseous tinctures, infusions and decoctions. And we have reason to hope that the work has only commenced, and that the chemist may further assist us by disarming most of our drugs of their revolting and disagreeable taste—a boon to both practitioner and patient.

Possibly most of the indications in therapeutics may yet be attained by the administration of medicines in other and less repulsive modes than through the stomach. While *inhalation* has been practised since the time of Galen, still modern chemistry and ingenuity have done much towards establishing it as *one* of the methods of exhibiting medicine. The method of *subcutaneous* injection is of modern creation,—daily experience proves its value,—by it we obtain a more rapid and certain effect from the remedy employed.

The practitioner of the present day can point with pride and satisfaction to the late improvements in *Practical Surgery*, without comparing its present state with the period at which the chafing-dish and the searing-iron were as indispensible to arrest hæmorrhage as is now the ligature; and when the cries of the sufferer were smothered only "by the hissing of the heated cauteries against the surface of the bleeding wound."

Appreciating the wonderful powers of nature in the cure of disease, his treatment of wounds and injuries is more simple and rational. He now allows the bleeding to cease, washes away all coagula, closes the wound and applies light water-dressings instead of the complex ointments, compresses, pledgets of carded tow, rollers, straps, &c., in use forty or fifty years ago. Nor has he the same dread of the appliance of stitches as his forefathers had. In fact, some of the greatest triumphs of modern surgery are associated with this simple mechanical process, as for example, the operations for cleft-palate, vesico-vaginal fistula, ovariotomy, &c.

The antiseptic system of treating wounds, recently suggested and put in practise by Lister, commends itself to the consideration of every surgeon; though a difference of opinion exists as to its merits, still experience may establish it as superior to all other modes of treatment.

There has been a great improvement in the treatment of sores "tending to heal," by the substitution of moist applications, instead of the ointments formerly employed, and in the "callous or indolent" ulcer by the application of blisters to the surface of the swollen part. I must also mention a very recent practice of M. Riverden, of Paris, that of transplanting portions of the skin for the closure of large granulating surfaces of ulcers, following burns, &c.

The substitution of effectual drainage in sinuses that remain after the evacuation of abscesses, for stimulating injections, sponge tents and pressure, is an improvement. And the drill, in deep-seated abscesses of bone, has, of late years, saved many a limb.

In few matters has surgery more improved than in the treatment of diseased joints; formerly recovery was considered almost hopeless, under the use of caustic-issues, &c.; whereas we now confidently look for recovery under perfect rest and extension. And should bony anchylosis take place, an artificial hip-joint may now be produced, by an ingenious operation suggested and recently performed successfully by Professor Sayre, of New York.

Since the commencement of the present century, many new operations have come into practice, as ovariotomy, the operation for vesico-vaginal fistula, cleft palate, removal of the tongue, the radical cure of hernia, excision of the upper and lower jaw, perineal incision in aggravated urethral stricture, delegation of the carotid, subclavian and other large arteries; in ophthalmic surgery, iridectomy, &c., and lithotrity, an operation characterised as one of the greatest additions to modern surgery, and one that must largely supersede the cutting operation of lithotomy, for, while the mortality from lithotomy ranges from one in six to one in ten, that from lithotrity, according to Sir H. Thompson, is about one in thirteen, and from present experience, it may be assumed that all stones weighing less than one ounce, in grown persons, should be removed with the lithotrite.

Increased knowledge of anatomy, physiology, and pathology, has enabled surgeons, within the same period, to remedy distortions and deformities arising from cutaneous and joint contractions. by subcutaneous incision and plastic operations.

Prior to 1809, when MacDowell, of Kentucky, first performed the operation of ovariotomy, every woman labouring under ovarian dropsy

was looked upon as doomed. And when Lizars, of Edinburgh, first operated in Great Britain, he was assailed by a certain amount of ridicule. I need not say to you that it is now one of the established operations, and for one of such magnitude marvellously successful, with a mortality of less than thirty-five per cent.

The experience of the practical surgeon teaches him to rely upon the powers of nature, and that it is his duty to assist and oftentimes to guide her; in other words, he is the pilot who can steer the ship, but who cannot make the wind blow. Knowing the wonderful assistance that nature will afford him, it is his boast that, in the present day, he can treat diseases without operative interference, where formerly the knife was considered indispensible; that he can substitute minor operations for more severe ones; that he can often save limbs by the removal of diseased joints, where years ago amputation was deemed inevitable; for example I need only mention excision of the hip, knee, ankle, shoulder, elbow and wrist joints, to prove the wonderful benefits of conservative surgery of late years. Removal of the ends of the bones in compound dislocations and fractures, instead of the limb, are examples of modern conservative surgery. I may also mention the treatment of aneurism by compression, acupressure, flexion, manipulation, galvanico-puncture, &c.

Improvements in individual operations have taken place, as in amputations, in the operation for hernia, that of removing cartilaginous bodies from the knee-joint, that of opening the canal from the inferior punctum, so as to obtain room for the passage of probes large enough to remove the obstruction in fistula lachrymalis, instead of styles permanently retained.

Acupressure, a new mode of restraining hæmorrhage, as recommended by Professor Simpson, is well worthy of practical application by the surgeon, for by experience alone, its value can be tested; it has its advocates and its opponents, so had the discovery of John Hunter; and who can say that it may not, at some future day, supersede the use of the ligature.

The most brilliant discovery in modern medicine, and one of the greatest boons ever conferred upon mankind, is the power the surgeon possesses of wrapping the patient in a painless sleep, while he is subjected to the horrors of the operating table. Yet, while accepting immunity from suffering, the patient incurs a certain amount of risk—statistics having proved that death has resulted from anesthæsia, regardless of the agent used, once in between 2,000 and 2,500 cases. The mortality is small, but let us hope that a substance may yet be discovered that will produce the effect required with impunity. Local anesthæsia, by freezing the part, is of modern origin, and is suitable for minor operations.

Practical Medicine advances by the discovery of new facts, and by the application of such facts to the treatment of disease. During the present century its advance has been quite as great as that of surgery.

The means of diagnosis at the command of the modern practitioners —his increased knowledge of the nature of disease,—and the improvements in chemistry and materia medica, enable him to apply his remedies with greater judgment, and to combat disease with more confidence of success than did his forefathers.

It would be hard to find a medical man in the present day recommending "*Lizards*" for the cure of cancer and venereal disease, as did Dr. Lettsom—a practitioner of standing in London—who read a paper to the medical society of that city in 1783 recommending them. Well may the following lines be attributed to him. He is made to say:

> When patients come to I,
> I physics, bleeds and sweats 'em,
> And if they choose to die,
> What's that to I, I lets 'em.
>
> I. LETTSOM.

Let us glance at the treatment of disease by *bleeding*. It is not many years since the lancet was in the hands of every practitioner, in daily, and I might say almost hourly use, whereas now it is one of the rarest operations; and instead of the loss of blood, we have the exhibition of stimulants;—and in place of almost starvation, we have the abundant use of nutriment. Now the question may be asked, what is the cause of this great change? It has certainly brought upon our predecessors, —by some,—the charge that they were ignorant and blind followers of error. But the reflecting man cannot bring his mind to believe that the fathers of British medicine were always bad observers and mistaken practitioners, consequently he is forced to look for the cause, in the "*change of type of disease.*" There are many strong arguments in favour of this doctrine,—arguments difficult to controvert, and when such men as Allison, Christison, Stokes, Graves, and Watson, give their strong adhesion to such belief, we may readily pause before denying it.

Many of us can call to mind the time when cold water was forbidden to a person with fever, and as for milk, he who gave it would have been accused of "feeding the fever" and thereby endangering the life of his patient. I need not say to you that such notions exist no longer, both being freely used.

In proof of the progress in practical medicine I may refer to improvements in relation to particular diseases. Consumption,—for example— a disease in which the physician's duty consisted in watching the slow "gradations of decay,"—making a prognosis of two years duration,—

and alleviating suffering as best he could. But now, under the use of cod-liver-oil, mineral acids, bitters and supporting nourishment, he no longer regards the disease as hopeless, and treats it looking for a cure; failing that, he confidently expects to prolong life. The experience and calculations of Dr. Williams justify the expectation, for he informs us that the average duration of life of phthisical patients has been extended from two years, the limit assigned by Laennec and Louis, to eight years. And he adds, that "in not very few cases, the disease is so permanently "arrested, that it may be called *cured*." I may mention the treatment of oxaluria, phosphatic, and other diatheses indicated by the state of the urine, the use of iodine in goitre and other affections, iodide of potas in syphilis, gout, &c., bromide of potas, in epilepsy, &c., arsenic in many affections of the skin, the alkaline treatment of rheumatism, the successful use of nitrite of amyl in tetanus, and in angina pectoris, of hydrate of chloral as a narcotic, of quinine in acute lumbago, of drachm doses of tincture of henbane, with a little sulphate of magnesia three times a day in orchitis, of large doses of quinine in military surgery as a remedy for pyæmia; the banishment of scorbutus from our ships, &c, &c., also the vast improvement that has taken place of late years in the treatment of diseases of the womb and its appendages, and in diseases of the eye, I may refer to the use of atropia as a substitute for belladonna, and the calabar bean as a local application to contract the pupil.

Formerly all infantile diseases were considered by some as the results of febrile action, and treated as such, by others, as the results of weakness and treated with tonics and stimulants, and by a third class as the results of the irritation of worms and treated with anthelmintics. Modern investigators have proved that the different organs of the child are liable to nearly the same diseases as the adult, and should be treated accordingly.

The mortality of infants is still very large, but of late years it has greatly decreased. Towards the middle of the last century, 60 out of every 100 children born in London, died before they had reached their first year of age; but the mortality has steadily diminished, so that now, about 35 in every 100 die at that period. About 600,000 are born annually in Great Britain; of these 300,000 would have perished. Now about 200,000 die, thus showing a saving of at least 100,000 human beings a year. In New York the mortality is still very large; *one-third* of the children born, die in the first year, and one half before they have attained their fifth year of age. In Geneva, records have been kept since 1590, and it has been ascertained that a child has now five times greater chance of living to the age of twenty-one years than it had three centuries ago.

About the middle of the seventeenth century, one in every forty or fifty women delivered in London, died of child-birth and its consequences; but as medical science has advanced, that mortality has decreased, till now about 1 in 150 or 200 die. There are about 600,000 accouchments yearly in Great Britain, still about 3000 mothers perish. If the old mortality held good, not less than 11,000 or 12,000 maternal lives would now be lost. Consequently we may proudly point to this modern advancement in medical science, effecting, as it does, in this item alone, a saving of the lives of 7000 or 8000 mothers a year.

The mortality in the army, years ago, was immense. It was a disgrace to those in authority who positively refused to listen to the repeated appeals of the medical staff. And it was not till after the Crimean War, when Miss Nightingale brought the fact before the nation, that the laws which preventive medicine had established and applied in civil life were put in force. The result was that since the period named, the mortality in the Guards has fallen from 20 to 9, and in the infantry from 18 to 8. And the improvement in war is still more striking. In the Crimean war the sick in hospital were nearly seven times the number of the killed, while in the Chinese war they were nearly equal. The relative proportions of zymotic sickness in the two campaigns were as 6 to 60.

The present death-rate of fever in England amounts to 385 per 10,000 of population, while a century ago, its death-rate was nearly 539, and at the middle of the last century the annual death-rate from all causes in London, was 355 per 10,000 of population, but in the middle of the present century, it was only 249. In Sweden, in the period from 1755 to 1775, the death-rate was 289 per 10,000 of population, while from 1841 to 1850 it was reduced to 205.

In pursuing this subject let us contrast the state of the unfortunate lunatic of the present day with what it was sixty years ago, when deemed incapable of human feelings he was incarcerated in a dungeon, bound with chains, surrounded by filth, cut off from the friendship and charity of his fellow mortals, and treated with contumely, scorn, and stripes, a human being buried, yet living. Need I say to you how changed all this is now, and with what happy results? With the knowledge that the poor sufferer possesses the feelings, impulses, and affections of man, he is surrounded by comfort, all restraint is, or should be removed; and he is put under proper medical and moral management.

The preservation of human health, and the prolongation of human life, are two of the great and noble objects of practical medicine. These objects are to be attained more by the prevention of disease than by its cure. But to enable us to prevent diseases, we should be well

acquainted with their causes. These causes and the best means of avoiding them, have in a special manner engaged the attention of the physician of modern days. By it he has learned the vast importance of sanitary measures. His investigations have taught him that the attacks of almost all diseases are increased in intensity and frequency, in our households and communities, by the want of sufficient air, light, water and drainage, as well as by the deleterious effects of decomposing animal and vegetable matters allowed to remain within and around our dwellings, and by the human effluvia concentrated in small and stifling bed-rooms. They have taught him also that when the preceding causes of disease have been abated, in special localities, by proper sanitary arrangements, human life as a consequence has been saved, misery avoided, and pauperism prevented.

We find the mortality in country districts always less than in towns. In the country districts of England, it is about 1 in 58, while in the towns it seldom falls below 1 in 45. In all large towns where proper sanitary measures have been adopted the mortality has decreased. For example in London, in 1840, the death rate was 1 in 40, it is now 1 in 45; so in Boston, in 1855, it was 1 in 39, it is now 1 in 41.

As a further proof of the influence of sanitary measures upon certain localities in towns, I may mention that St. Giles, in London, formerly a filthy parish, now since every street and court has been brought under control, the mortality has been reduced from 50 in the 1000 to 15 in the 1000.

Class and occupation exercise their influence upon mortality, for we are told by Dr. Lyon Playfair that in Liverpool the average age at death of the gentry was 43 years, tradesmen 19, and laborers 16, the average age of all classes being 22 years.

In pursuing this subject I may mention that it is estimated that there are 8000 preventable deaths in New York, yearly. It is further estimated that for every death there are 27 cases of sickness, which would give a total of 216,000 cases of preventable sickness to be treated. When we reflect upon the misery, wretchedness and pauperism produced by these 216,000 cases of sickness capable of being prevented, it affords ample occupation for the physician, the philanthropist and the statesman.

Let us look at one other advancement of practical medicine, one to which the physician may proudly point as the greatest discovery of the age, a victory of medicine over disease and death. I allude to the discovery of vaccination by Jenner, to whom Providence, as it were, entrusted the office of teaching the surgeon, with an almost invisible speck of matter upon the point of his lancet, to defy, in a measure, one of the most fatal diseases that ever afflicted the human race.

The vast importance of this discovery can only be appreciated when we take into consideration the ravages produced by small pox prior to the introduction of vaccination. We are told that this disease was a terror to mankind, "sweeping over the land like fire over the prairies, smiting down prince and peasant;" that about the year 1519 in Mexico, it suddenly carried off 3½ millions of population; that in Brazil in the year 1563 it extirpated whole races of human beings; that about the same period in the single province of Quito, it destroyed 100,000 Indians; that in Iceland in 1707 it carried off 18,000 out of a population of 50,000; that in Greenland in 1737, nearly two-thirds of the population were swept away by it; that in France it caused one-tenth of all the deaths, and in England one-fourteenth; that the annual mortality from it in Europe alone amounted to half a million; that one-third of those attacked died, and that it destroyed, maimed or disfigured one-fourth of mankind.

Let us now look at the pleasing side of the picture, and see what the mortality from this loathsome disease is at present. The following illustrations selected from various sources, give an approximative idea of the mortality from small-pox in each million of the population before and since the introduction of vaccination.

Sweden.....	2050	185	Copenhagen.....	3128	286
Westphalia..	2643	114	Berlin.....	3422	176
Moravia.....	5402	255	England.....	3000	260

Doctor Farr tells us that the combined mortality of small-pox, measles and scarlatina at present, is only half as great as the mortality occasioned by small-pox alone, before the introduction of vaccination.

Experience and statistics teach us that small-pox occasionally occurs among those who have been vaccinated; that if 1,000 persons who have been *well* vaccinated should be exposed to the contagion of the disease, about twenty-six will take it; that among vaccinated persons infected with small-pox, the danger of the disease is chiefly determined by the badness and insufficiency of their vaccination; that the fatality of small-pox when it attacks the *unvaccinated* is 350 per 1,000; that its fatality to such *vaccinated* persons as it infects is, taking them indiscriminately, 70 per 1,000, but, distinguishing vaccinated persons into two classes, first, those who have been vaccinated in the best known manner, and second, those who have been badly vaccinated, the fatality of small-pox, if it infects the former, will be 5 per 1,000, if it infects the latter, 150 per 1,000; and that the risk of the one is 30 times that of the other. Or, in other words, let an unvaccinated person contract small-pox, and the chances are more than *one in three* that he dies. Let a very badly

vaccinated person—a person with one imperfect cicatrix—contract small-pox and the chances are not quite *one in eight* that he dies. Let a person with two good vaccine cicatrices have small-pox, and his chances of dying are less than *one in forty*. But persons who have been vaccinated in the best and most complete way, will, if they ever get small-pox afterwards, not die of it at the rate of much more than *one in two hundred.*

It may be safely asserted that the lancet of Jenner, armed with the cow-pox matter, has saved in the world more human lives than gunpowder and the sword were ever successful in slaying, during any century in the history of mankind. And let us say, honour to the man who found the way to arrest this dreadful scourge, and who taught us that the seeds of the disease transferred to another soil might be made to germinate with a healthy and saving influence—a glory to our art, and to the nation claiming him as a son. Yet that nation neglected to bestow any mark of distinction upon the doer of all this good. Such favours being reserved for the inventor of instruments for the destruction of human life—the user of them—the courtier, and the politician; the man whose life is spent in ministering to the suffering of his fellow-man, however successfully, being generally the last to receive such honours.

It is to be regretted that notwithstanding the facts before us, men are to be found ignorant and weak-minded enough to deny the benefits of this wonderful agent. And we hear of "*anti-vaccination societies,*" composed, I am happy to say, with very few exceptions, of men not belonging to the profession; men whose prejudices must have destroyed any reasoning power they might have possessed.

According to Short's mortality bills of London, plague, dysentry, small-pox, ague, and child-birth were the most destructive diseases in the time of Sydenham. It is needless for me to say that they sustain their formidable and fatal character no longer. And does not the history of the past encourage us in the belief that perhaps in 60 or 70 years hence under the guidance of hygienic and medical means, the same may be said of those diseases that are at present the most destructive and deadly in their effects upon our population; namely, consumption, convulsions, typhus-fever, scarlet-fever, pneumonia, and bronchitis. We have the arrest of small-pox by vaccination as a stimulus to induce us to follow the footsteps of Jenner. And who can say that means may not shortly be devised to arrest the ravages ofscarlet-fever, measles or whooping-cough? For the conquest of small-pox appeared to our fore-fathers—judging from the writings of Dr. Mead—as impossible as the conquest of these maladies can appear to any one now.

While we contend that medicine has advanced we must also acknowledge the uncertainty of the art. The source of this uncertainty may be found partly in its imperfections, but more in the intractability of intense forms of disease, the ferments of which poison the system to such an extent that death must inevitably be the result. Take as an example, malignant scarlet-fever; observe the utter prostration, rigors, stupor, swollen throat, offensive breath, and thready, failing pulse, which indicate intense blood-poisoning. Here death is as certain as if the patient had taken a poisonous dose of prussic acid. Medicine is foiled by the overwhelming power of its antagonist.

In conclusion let us hope that enough has been shown in this paper, imperfect as I freely acknowledge it to be, to prove that the science of medicine has kept pace with other sciences in the march of improvement. Yet, in the face of such facts, the workers in our noble profession are too often told that they are not advancing because they cannot conquer death, or triumph over all forms of disease. I do not allude to believers in "*isms*" or "*pathy's*," it is their interest to say so, and we can afford to treat them with silence. But, I grieve to say it is the fashion now-a-days to hold up the stumblings and uncertainties of medicine to the public gaze; to invoke ridicule and censure, and should a practitioner get into the hands of a jury, here again he has to contend against ignorance of medical power and responsibility, and expects to be told that if he does not save life or limb he must pay the penalty.

St. John, N. B., January 18th, 1871.

Valedictory Address to the Graduates in Medicine and Surgery, McGill University. Delivered on behalf of the Medical Faculty at the Annual Convocation, held in the William Molson Hall of the University, on Friday, the 31st March, 1871. By GEORGE E. FENWICK, M.D., Professor of Clinical Surgery and Medical Jurisprudence.

GENTLEMEN GRADUATES.—It is a time honoured custom to address to the Graduating class a few parting words of counsel, and in doing so allow me to call your attention to the very important era in your career which has this day commenced. You go forth from these walls fully recognized by the outer world as regularly educated physicians and surgeons, and in every respect save one we can endorse that opinion; from the very creditable manner in which you have severally acquitted yourselves at the examinations, we feel confident that you will one and all reflect credit on McGill University. The one point alone in which you will for a time feel your own incompetence is that of experience; resembling the period of early childhood you are about to trust to your

own powers; your gait may at first be trembling, and for a time you will painfully experience all that hesitancy shown by the infant when first it parts from its mother's arms on its onward walk.

The conscientious physician at the outset of his career is fully aware of his want of experience—experience which lends to him courage to persevere in what he feels is right. Brimfull of theory he assays to treat diseases according to doctrines that he has seen successfully put in practice at the bed-side, and if disaster attends his efforts he is too apt to attribute his want of success to his own short-sightedness, or else to look upon his theory as a delusion. Surgery, on the other hand, being a more exact science, will generally yield more apparent favourable results. But to be a surgeon a man requires all that firmness of resolve and decision of character, with mechanical aptitude, which is occasionally seen, but which is by no means a common gift. To be a surgeon a man requires a special training. Many men can perform operations; they may possess a sufficient amount of animal courage to risk the severance of vital parts, and even jest at a spouting artery or quivering muscle—but gentlemen, this is not surgery. Let me counsel you, therefore, at the outset of your career, not to be too full of confidence on the one hand, nor yet too diffident on the other. Be careful to study well each case intrusted to your charge, and if you have any doubt, remember that the life, perchance, of a fellow-mortal is in your hands, and seek aid and counsel, if attainable, from those of larger experience than yourselves. Be not hasty at arriving at a conclusion as to the nature of any given case: it may look clever, and perhaps if a lucky hit be made, may tend to elevate you in the opinion of those who employ you. If, on the other hand, by arriving at too hasty a conclusion the interest of your patient suffers through your error, it will be a source of life-long annoyance, although the circumstances may be known to you alone.

Throughout your pupilage you have had ample opportunities of seeing the principles taught in the class room put in practice in the wards of the Hospital. And although medicine and surgery must be looked upon as progressive sciences, and change is almost of daily occurrence, yet many aphorisms received in early life come back to the physician and surgeon with such force as to convince him that the experience and intuitive knowledge of those who preceded him, were based on sound principles. Gentlemen, you have entered on a life of drudgery, where the strain of mental work is only equalled by the bodily fatigue which each day will call forth. While other men take their ease and comfort, the physician and surgeon is forced to labour. No rest can he expect; his days and

nights are given in the service of others, and in the end he receives thanks, given grudgingly, for what no money value can compensate. What man is there, that is mortal, who can endure the constant strain on the energies, physical and intellectual, which the practising physician or surgeon has to go through? Throughout your career you will fully recognise the necessity of keeping pace with the advance of knowledge; this will necessarily entail devotion of a great portion of your time to study. Returning home after a day of fatigue and mental anxiety, you will feel that your work is incomplete and you will be forced to labour still, while your more fortunate neighbour is enjoying the solace of domestic repose, without a care, and without the chance of disturbed rest in sleep, which is to our exhausted energies a physiological necessity.

Remember that to give satisfaction you are expected to be successful, and the successful man is not usually a book-worm; he should, with his mental acquirements, possess an amount of common sense, to know when and how to apply his knowledge. Bear in mind that the world is sensorious, hypercritical; every action of your life will be carefully scrutinized and criticised—criticised in no spirit of benevolence or honest kindliness—your very success will be subject of remark and, perchance, disparagement; so that wearied of well doing you may at times feel disposed to relinquish the practice of your profession in disgust. Do not expect to receive anything but hard knocks; and as the world has seemingly conspired against us as a class, let the knowledge of what you are to expect draw you in closer bonds of union towards your brother practitioner. Ever remember, in your walk through life, if brought in antagonism with a brother, that you are fellow labourers, and if you observe error or misconception, give honest counsel and advice. If on the other hand, you are convinced that the counsel and advice of a brother is correct, although adverse to your own preconceived opinion, yield with gracefulness, and do not enter into a controversy, which may end in your own discomfiture.

It may not be considered out of place to refer casually to the present position of the profession in the neighbouring province of Ontario. Those of you who hail from the west are fully aware that the standing of the profession has been lowered by ill-advised but, perhaps, honest men. As professional men, you will find yourselves allied and on an equality with many whom you cannot meet or recognize as physicians or surgeons. Many of these persons constantly advertise in the daily papers that they are Licentiates of the College of Physicians and Surgeons of Ontario. Some never attended a course of lectures on medical or surgical science,

and some never passed any examination as a test of proficiency; nor have they further qualification than that above referred to. These persons possess greater powers in the Medical Council of Ontario than do members of legitimate medicine. This insult, for I can call it by no other name, has been put upon our profession by the Local Legislature of Ontario; but it admits of remedy. Individually you are powerless; but, as a body, you can wield a power that will, in time, completely change the present aspect. If, as one man, the regular profession of Ontario act for the common weal, they can do much towards obtaining a repeal of the present objectionable law under which they are governed.

During the last few years there has been formed in this Dominion of Canada a Medical Association on the same basis, and with the same object as the British Medical Association, which has been for many years past in the parent state the rallying point of the profession, and has exerted so great an influence in advancing the present high character of medical education in Great Britain. It is greatly to be desired that members of the Medical Profession throughout the Dominion should join our association, and further our objects, which are not alone those of social and professional intercourse.

I would suggest the establishment of Branch Associations throughout the country, and that each Branch so formed should send one or more delegates to our annual gathering. Let the work be entered into in an earnest spirit of reform, and, above all, by the profession in Ontario with a full determination of relieving itself from its present anomalous position.

Coming back to a subject more pertinent, allow me to announce that the governing body of this University has decided on the erection of a new building for the use of the Medical Faculty, and arrangements have been made whereby we hope that before the commencement of another session, a handsome and commodious building will be far advanced toward completion. This, with all modern appliances, will give increased facilities for illustrating the practical portion of the course. This is a want which has been severely felt in view of the increasing number of students attending the classes of this faculty.

In conclusion let me allude to the high trust you have this day assumed. Your conduct in every day life will be narrowly scrutinised, and what in other men would be passed over as a foible, or error in judgment, will in you be censured as a crime. A physician is expected to be grave, serious, thoughtful, as though he were ever dealing with the grim messenger—this, I need hardly tell you, is too much to expect, but there is a wide difference between cheerfulness and levity. Endeavour, therefore, so to

conduct your walk through life, that at its close you will be remembered with affection and esteem. Let your life be pure, simple, spotless—ever ready to promote a good work of benevolence in connexion with your profession, so that at the end you may reasonably expect the approbation of your fellow men, and look forward with hope for a reward beyond the grave.

The physician is a very intimate friend in a family, and is often the custodian of family secrets; how necessary, then, for him to be silent and reserved. The world is full of littleness, but, in this respect, the medical man should take a high and honourable stand. Bacon held "every man a debtor to his profession, from the which, as men of course do seek to receive countenance and profit, so ought they of duty to endeavour, themselves, by way of amends, to be a help and ornament thereunto."

At the outset of your career you will have many temptations, which, if yielded to, lead into the vortex of unsatisfying pleasures. Life is all too short to be frittered away in vanity; time lost can never be recalled, and you will bitterly regret, if, after years spent in frivolity, you arrive at that period when the mental energies are failing, without having availed yourselves of the world's advance. Be therefore no laggards—persevere from the very outset—acquire habits of regularity and industry—so will you experience a measure of satisfaction at the end of each day's toil, and at life's close feel that your career has not been objectless.

MEDICO-CHIRURGICAL SOCIETY OF MONTREAL.

MEETING HELD 18TH MARCH, 1871.

Dr. ROBERT GODFREY, Vice-President, in the chair.

Dr. GEORGE E. FENWICK related the following interesting case:—

I am induced to bring before you this evening a case simple in character, but of interest from its rarity:—E. S., aged 51 years, a strong, healthy woman, the mother of eight children and a widow, consulted me professionally on the 28th January, for an attack of mumps; the parotid and sub-maxillary glands of right side were swollen, tender, and somewhat glazed; there was considerable pain of an aching character, great distortion of the face, and inability to open the mouth or swallow anything but liquids. She had been ill for two days, the attack having come on gradually. As her bowels had not moved for two days, I prescribed a saline aperient, and advised the face to be swathed in flannel. The following day she appeared better, had passed a good night,

the swelling was quite as great, but there was less heat of surface and less tenderness. I ordered a saline mixture of chlorate of potash to be repeated every two or three hours. On the third day of my attendance, the fifth of the disease, the swelling and tenderness was almost gone and she expressed herself as feeling very much better; towards evening she was attacked with violent headache, retching, and a a sense of fulness in the lower part of the abdomen on the right side, which was tender on deep pressure. The following morning she noticed a distinct catamenial flow which lasted four days and then gradually subsided. During this attack the tenderness of the abdomen continued, and she was unable to stand in the erect posture without increasing the pain; she noticed also that while in bed stretching out the right leg occasioned increased pain so that she retained the thighs flexed on the abdomen. This discomfort gradually subsided and she recovered without further trouble, after a week's confinement to bed. It will be remarked she was 51 years of age, and the catamenial flow had ceased during the past six years.

Metastasis in mumps is noticed as occurring to the testis in the male and the mamma in the female; the brain or its membranes have, in some cases, been affected secondarily. When the testis becomes affected it has been noticed to occur on the same side as that on which the disease has attacked the parotid gland, and in some cases when both parotids have been affected metastasis has taken place to both testes; the same fact has been noticed as occurring in metastasis to the mammæ; but I have failed to observe the record of metastasis taking place to the ovary; though why it should not as likely occur to this organ, as being the analogue in the female of the testicle in the male, will appear at first sight somewhat singular.

In the case at present recorded, certainly the ovary was affected, as evidenced by the sense of fulness in that region which was accompanied by deep-seated tenderness. In the article on mumps in "Reynold's Practise of Medicine" the writer states that the labia and uterus are in some cases secondarily affected; but no other author mentions the fact that metastasis takes place to the ovary. This is the only case of the kind I have had an opportunity of noticing during a practise extending over twenty-four years, although I have observed on several occasions in adults the testis becoming affected, after subsidence of the disease in the parotid gland.

Dr. REDDY enquired if the fever subsided when the menstrual flow commenced.

Dr. FENWICK said that it did.

Dr. DAVID said that some years ago a somewhat similar case occurred in his practice. Mumps broke out in a family, and five or six were attacked with it; two of them were young ladies, 17 and 20 years of age; both were very irregular in their menstruation, pale, and chlorotic before the attack. During the course of the disease they both suffered from menorrhagia, when the mumps at once subsided. From that day till the present time they have both been quite regular. One is married, and has a large family. Old authors state that a condition of things similar to that mentioned by Dr. FENWICK was common; such was, however, not the case now, but whether due to better treatment, he could not say.

Dr. REDDY said the interesting part in Dr. FENWICK'S case was the sudden appearance of the discharge so long after the time of natural arrest was past.

Dr. DAVID mentioned a case that occurred many years ago in Wales, where a lady, over 70 years of age, had a menstrual flow from metastasis.

Dr. HINGSTON thought there were two remarkable things in the case related by Dr. FENWICK: first, that mumps should have occurred at all in a lady of so great an age; and secondly, that it should bring on a flow. Lately, there was an epidemic of mumps among the students of St. Mary's College, where, in boys, there was metastasis to the breast. He recently also had another case in a little girl, who had not attained puberty, where there was metastasis to the breast.

Dr. GODFREY stated that mumps had been very prevalent in his practice. In one family, where all or nearly all were attacked, one of the members had them pass on to suppuration.

Dr. FENWICK in reply stated that he had examined all the older authors that were accesssable to him, and could not find any reference to the subject; his friend, Dr. David, made a broad statement, but did not mention any author who drew special attention to this point.

Dr. PELTIER then read the following paper on

RETROVERSION OF THE UTERUS:

On the 20th January, 1870, I was called to attend a Mrs. C., aged 28, from Rochester, who had arrived in this city the month previous—she is the mother of three children living—from that date up to the 5th of February (16 days), she was labouring under bilious fever, for which she received all the treatment which is ordinarily followed in such cases by all practitioners of experience.

I had been told at my first visit that she was pregnant, and regretted much that she was so; mentioning also, that it was about two months since she had had her last changes. All that she complained of then was

of a bilious disorder. I saw her every day, and found her improving, so much so, that I allowed her to get up on the morning of the 4th. On the evening of the 5th I was called suddenly to see her, when, to my surprise, she had a very high pulse, a swollen abdomen, with tympanitis; a slight discharge of blood gave me to believe that miscarriage was about to take place. I calmed her fears as to any serious consequence, and, after having ordered some antispasmodic, I retired. Next morning, the 6th, I was in attendance early, fearing that some storm was ahead. I was not mistaken, for I found my patient in what I might justly call a typhoid state—facies hypocratic; sweating profusely; pulse small, thread-like, 120; abdomen still distended; urine had not been discharged since evening previous; bowels had been moved; still slight discharge of blood; great nervous excitement from great pain all over abdomen; restlessness, and anxiety about her position; pains simulating that of labour.

I did not hesitate to enquire at once as to the cause of these sudden changes, which the symptoms proved to be alarming.

I made a vaginal examination and found—what? a globular tumour low down, which startled me; after a more minute examination, I could not reach the os tincæ, and concluded that I might have to deal with retroversion of the uterus, which, necessarily being gravid, made the case very much worse. Examination per rectum convinced me that it was really complete retroversion. I tried to replace the uterus, but to no avail; passed the catheter into the bladder, expecting through this agency to obtain replacement.

If we were to believe authors—Moreau, Hunter, Velpeau, Dewees, Meigs, and others—replacing the womb would be always successful. I am sorry that I cannot agree with them, at least, when having to replace a gravid uterus. It is true that this is the first case of the sort which it has been my lot to meet.

I therefore concluded that, as the case would prove fatal, it was my duty to inform the husband, and also her sister.

A consultation was advised, and at noon, Drs. D'Orsonnens and Trudel were in attendance; their examination corroborated what I had thought to be completed retroversion. The case being urgent, we decided on trying to reach the os tincæ with finger, if possible, and with a small crotchet afterwards, so as to allow us to puncture membranes and to give escape to the embryo.

We did succeed in puncturing the membranes with a straight catheter, in which there was a small stylet, the point of which is in a lancet form. The embryo did not escape; the mother breathed her last two hours after the operation.

A post-mortem examination was made at 8 a.m. next morning, the 7th, when the uterus, retroverted, was found pressing on rectum, with elongated round ligaments, and occupying the bottom of the pelvis; great inflammation of peritoneum, but no exudation; womb was opened, and there we found an embryo a little more than two months old.

I see that a case exactly similar to this one, so far as the retroversion by itself is concerned, is related by Dr. WEIR, of Glasgow, where the the patient, after undergoing a similar process as the one I resorted to, perfectly recovered after a four months' fœtus had been extracted.

Now, gentlemen, this is a most appalling case, which I submit to your reflection. There is one remark to be made concerning this case, that on the evening previous—that is on the 5th—I was told by her sister that she had taken Clarke's pills, some days before she was taken ill, to bring on miscarriage. This led me to believe that, probably what I had taken to be bilious fever, might have been symptoms of the retroversion of the gravid uterus from the use of these pills, which had acted forcibly on the muscles of the uterus, and reacted therefore by irritation of the sacral plexus on the spinal marrow, and thence on the different organs, particularly the stomach and liver, giving rise to irritation such as to simulate bilious fever.

Dr. REDDY. Did you suspect that the patient had previously used mechanical means to procure abortion? (No.) Did you adopt but the one method? (Yes.) Did you find retention? (Yes.) Had had a very similar case following a fall—patient was greatly collapsed for twelve hours after the accident; the symptoms were much the same as those detailed, save that they were not of a typhoid character. After reduction and the use of leeches and warm fomentation she quite recovered.

Dr. HINGSTON enquired how Dr. PELTIER recognized through the rectum so readily, the retroversion of the uterus; he believed it very difficult to diagnose retroversion without something in the uterus itself; and further that it was almost impossible to reduce a uterus thus displaced without the sound or some other instrument introduced into the cavity. In a great majority of cases, if a pregnant female complain of severe (and perhaps sudden) pain in the back and epigastrium and there be no prolapse, you will probably find retroversion or retroflexion.

Dr. FENWICK could not agree with the last speaker as to the difficulty of diagnosing retroversion or the necessity of the sound. He had seen several cases and in these the nature of the malposition was readily made out by the general symptoms, as frequent micturition and difficulty in defecation, and by the vaginal touch, discovering the os high up behind the pubis and the existence of a globular tumor encroaching upon the rectum.

Dr. HINGSTON had met with cases in which the os was against the bladder and a tumor in the rectum and still the sound went forward. He thought we should all use the speculum less and the sound more, and we would get better information.

Dr. REDDY spoke of the difficulties occasionally encountered in the use of the sound, as for instance, an obstruction at the inner os, and recommended the Sims' probe as free from this objection.

Dr. FENWICK did not wish to be understood as condemning the use of the sound, but simply that he did not consider it a difficult matter to fully reorganize retroversion without it. In Dr. PELTIER'S case there were reasons why the sound should not have been used, as he was led to believe that the uterus was gravid.

Dr. CRAIK thought the uterus was a much abused organ. There was far too great a tendency to attribute every disorder arising among females, to irritation of the uterus.

A vote of thanks having been tendered to Dr. PELTIER by the Society, the meeting adjourned.

PERISCOPIC DEPARTMENT.

CHEMICAL CLIMATOLOGY.

By R. ANGUS SMITH Esq., PH. D., F.R.S.

We live in air, and the air flows continually through us; no wonder, then, that we are influenced by climate, which means the condition of the air. When we speak of climate we think of the atmosphere in constant motion, bringing with it different degrees of temperature and moisture from distant regions. It is everywhere constantly changing, but the changes are of more frequent and of greater amplitude in some places than in others. The average condition is the climate of a place. The changes made by the movements of the air, are numerous. The operations of man also are productive of changes so striking and so vital, that we may be said to make a climate for ourselves according to our mode of living. We rush over the world, scarcely considering that the air we inhale must change at almost every step; and we build our houses not thinking that every field has a climate of its own, unless circumstances are more nearly the same than we can hope for in our country. In extensive tracts, where soil, level, and inclination are similar, such as great prairies or steeps, there will be few changes, until the borders are approached, in which case contiguity of other influences will produce a variation. In England, which is comparatively a small country, with much variety of soil, it is difficult to find a place where a short distance

does not produce some change, and in Scotland, a still smaller and more aried country, the differences of climate are more striking. Indeed every farmer studies his land in this respect; and the fields are devoted to various purposes, according to climate as well as soil.

We are exposed to great changes of climates arising from the condition of our civilization; and although we cannot effect complete alterations, it is possible to do something. To learn the method, we must by careful observation ascertain how we are effected. Who would have thought that persons living in a swampy district could be cured of ague, and regain their steadiness of muscle by simply putting drain-pipes under the soil around them? Who would have thought that cold, bracing weather, which is popularly supposed to be healthy, would be so deadly to many, as is shown by the Registrar's reports? But so it is, and we despise less than before the instinct that shrinks from cold. Who would not be surprised at the meteorologist watching the fluctuations of his barometer, remarking, "This is a dreadful night somewhere, and wrecks must even now be taking place?" But the admitted correctness of such inferences and their practical utility show the value of observations of the barometer, and hygrometer, and of the wind and rain fall.

Circumstances led me to examine the subject rather from the point of view which may be called chemical, as distinguished from the physical and medical views.

CONSTITUTION OF THE ATMOSPHERE.

Gases.

Regnault was the first to show clearly that there are consistent differences in the amounts of oxygen and nitrogen in the atmosphere of unwholesome places not closely confined within walls. Having been appointed to examine the air of mines by the Royal Commission of which Lord Kinnaird was chairman, I was led to examine several hundred specimens of air differing from the standard usually found on the surface of the earth. It was needful to examine the purer air also as a means of comparison. This was done by obtaining specimens from the principal hill tops of Scotland, and from heath-land and shores, as well as from the surface of the ocean. A few were also obtained from German deep workings, and a very small number from marshy places in France and Switzerland. A considerable variety of artificial climates in close places were also examined, and found to approach the condition of the less crowded or better class of metal mines. In addition to these the air of town and country was compared, and that found in different states of the weather. The result as regards oxygen is shown in the

following table. The details of the analyses may be seen in the report on the "Air of mines and Close Places" in the appendix to the report of the Royal Commission in 1864; and in the late volume of the Memoirs of the Literary and Philosophical Society of Manchester.

OXYGEN IN THE AIR.—SUMMARY OF AVERAGES.

	Volume per cent.
N. E. sea-shore and open heath (Scotland)	20·999
Atlantic, lat. 43° 5. long., W., 17° 12'	20·99
Tops of hills (Scotland)	29·08
In a suburb of Manchester in wet weather	20·98
In a suburb in Manchester in wet weather	20·96
In the outer circle of Manchester, not raining	20 947
Low parts of Perth	20·935
Swampy places, favorable weather	20·922 to 20·95
In fog and frost in Manchester.	20·00
In a sitting room, which felt close, but not excessively so..	20·89
Best ventilated wards in three London hospitals—	
Day	20·92
Midnight	20·886
Morning	20·884
In a small room with petroleum lamp	20 84
Ditto, after six hours	20·83
Pit of theatre, 11.30 p.m.	20·74
Gallery, 10·30 p.m.	20·86
About backs of houses and closets	20·70
In large cavities in metalliferous mines (average of many)	20·77
In currents in metalliferous mines (average of many)	20·65
Court of Queen's Bench, 2nd February, 1866	20·65
Ditto at Lantern	20·49
Under shafts in metalliferous mines (average of many)	20·424
In sumps or depressions in metalliferous mines, (average of many)	20·14
When candles go out..	18·5
The worst specimen yet examined in the mine	18·27
Very difficult to remain for many minutes	17·2

CARBONIC ACID IN THE AIR.

Hills above 3,100 feet	·0336
Do. between 2,000 and 3,000 ft.	·0332
Do. between 1,000 and 2,000 ft.	·0334
Do. below 1,000 feet	·0337
At the bottom of the same hills	·0341
On hills in Scotland from 1,000 feet high to 4,406	·0332
In the sts. of London, summer.	.0380
In the London parks and open places	·0301
On the Thames at London	·0343
Where fields begin	·0369
Manchester streets, ordinary weather	·0403
During fogs in Manchester	·0679
About middens	·0774
In workshops, to	·3000
In theatres, worst parts, as much as	·3200
In mines, largest amount found in Cornwall	2·5000
Average of 339	·7805

After finding carbonic acid and oxgen, we have been accustomed to take the remainder as nitrogen. It would, however, be well to know if there is really any tendency in nature to keep up a definite amount of nitrogen. We know nothing that can diminish or increase its amount directly to any appreciable extent; and when the amount of oxygen is diminished by breathing, the space is filled up by carbonic acid, leaving the same proportion of nitrogen as before. If, however, this carbonic acid is washed out or absorbed, we have at once air with increased nitrogen, but diminished oxygen. This may be supposed to happen when rain washes carbonic acid out of the air of towns, as in a perfectly

tight chamber, the carbonic acid formed by breathing is absorbed by lime. Then the nitrogen increases proportionately, the oxygen diminishes really, but the air is kept for a long time in a state pleasant to breathe. It is found, however, that in towns when the rain washes out the carbonic acid the oxygen is greater than before. In such cases the rain probably makes an exchange; it absorbs the one and gives out the other. This however, has not been proved, and inquiry is wanted.

It is interesting to examine how far this action may be carried. Some of the analyses gave more than 21 per cent of oxygen. This number is not given among the averages, which alone are used here. It is usual to think this a mistake, but it may not be so: as nature has evidently a mode of adjusting differences, certain portions of the air may have at times a greater stock of oxygen for the purpose. The purity of air may be considered as favorably affecting the sanitary state of the more moist counties; but the actual increase of oxygen there is not proved. We may suppose that as pure water, dissolves air with a greater amount of oxygen in it than common air, the pure air may give out some in falling. In that case we require to suppose that the amount abstracted from the upper regions of the air renders the proportion smaller. This would explain the fact that a smaller amount is found on the tops of mountains. We have in vegetation a source of oxygen at certain seasons, and also in animalcular life; bnt this would not be available to produce the result on a sudden in a town during rain fall. The formation of ozone in the upper atmosphere does not give us more oxygen; we obtain only a more active condition of that element. The formation of ozone at the surface and of nitrous gas also, by evaporation, affect, in conjunction with the elimination of oxygen by organisms, the supply of that which may be removed.

It would be interesting to know what is the constitution of the air in various seasons of the year, and over various lands and crops, as well as amongst the crops, and in forests.

It will be observed from the table that the amount of carbonic acid does not fall below 0·03. Smaller values have, however, been observed in plains. When the oxygen rises high, the amount may be considered correct, even when the percentage is volumetrically wrong. For example let some of it be as ozone; the condensation of the ozone would produce a result greater than 100. The amount of nitrogen is generally calculated from the remainder, and not directly estimated. It may turn out that by following this clew, we may obtain a mode of analysis of the air for ozone if it is condensed oxygen.

Some people will probably inquire why we should give so much atten-

tion to such minute quantities—between 20·980 and 20·999—thinking these small differences can in no way affect us. A little more or less oxygen might not affect us; but supposing its place occupied by hurtful matter, we must not look on the amount as too small. Subtracting 0·980 from 0·999, we have a difference of 190 in a million. In a gallon of water there are 70,000 grains let us put into it an impurity at the rate of 190 in 1,000,000: it amounts to 13·3 grains in a gallon, or 0·19 grammes in a litre. This amount would be considered enormous if it consisted of putrifying matter, or any organic matter usually found in water. But we drink only a comparatively small quantity of water, and the whole 13 grains would not be swallowed in a day, whereas we take into our lungs from 1,000 to 2,000 gallons of air daily. The detection of impurities in the air is therefore of the utmost importance, and it is only by the finest methods that they can be ascertained in small quantities of air, even when present in such quantity as to prove deleterious to health.

We must remember also that the blood receives the air and such impurities as are not filtered out in its passage, while it is the stomach which receives the water we drink, and that organ has for many substances a power of disinfection and destruction which blood does not possess. If by inhalation we took up at the rate of 13 grains of unwholesome matter per day—half a grain per hour—we need not be surprised if it hurt us. Such an amount is an enormous dose of some poisons, and yet this is not above one two thousandth part of a grain at every inhalation. It is marvellous what small amounts may affect us, even when by repeated action, they do not cumulate as certain poisons do. The carbonic acid numbers might have been used instead of the oxygen numbers, with the same result. On the actual affect of carbonic acid there are separate experiments: but its amount is an important index to the state of the air. The organic matter is the dangerous agent, but of all organic matter, some of it may be wholesome, some neutral, and some putrid, but the most dangerous seems to be the organized, existing in minute germs or spores.

We began by assuming very small shades of difference, namely, 190 in a million; but if we examine the table we find much greater amounts. Take, for example, the pit of a theatre: we have, by subtracting 20·74 from 20·999, a difference of 2,590 in a million, or 14 times more. And so on we may go to the lowest, where we have 17·2, which taken from 20·999, leaves 3·799 or 37·990 in a million, or 200 times more than the first example. The conclusion to be drawn from all this simply is that we cannot make the analysis too minutely.

SOLID BODIES IN THE AIR.

Boussingault, Vogel, Southwood, Smith, Pasteur, and others, have found organic matter in the air. Spores and germs were long ago known to be disseminated by it, although unseen, but there was no systematic method of examining the air of mines, it was found that the tubes in which air specimens were collected contained a good deal of dust, some of which was crystalline. These crystals were chiefly sulphate of potash, but some were nitrate of potash, and perhaps carbonates from the exploded saltpetre. It was possible, therefore to obtain in a very distinct form the solid matters in such cases.

This and some previous experiments led naturally to a very simple mode of washing out the impurities of the air. The air of a large bottle was shaken in contact with water: the air was renewed as often as was desired, and the water then examined. The results obtained by this means were very distinct, and no air was found so free from impurities as to leave the water clean. By this mode forms and organisms were obtained which clearly have vitality, since in some the power of locomotion was developed.

In one atmosphere a certain milkiness is observed by washing a single bottle of air; in another it requires a hundred bottles to produce an equal amount. If the amount of visible impurity were all that was required to be known this method would be sufficient for all purposes; but it is desirable also to know the quality of the substances. In a cowhouse where there were diseased cattle, a large amount of matter was found in the air, which was easily seen by washing a half-gallon bottle of air, or even less. May not some of these substances carry, or be themselves the disease? The only difficulty lies in discriminating between those which conveyed the disease and those which did not. There are forms floating even where healthy animals live; some found, for instance, in a stable where were healthy horses, and some in the wet on walls and windows of places exposed to perspiration. Hospitals might be examined in this way, and many other places, such as swamps, which might be expected to give marked results.

If, however, the undeveloped spore shows no distinctive mark, it may be developed by keeping it in the medium in which it was caught. Instances occurred when no locomotion was at first visible, but became so after a time. This was observed several years ago in perspiration, and last year in the washings of air. Now, if we could develope them so as to distinguish, an important point would be gained.

The air washings promise to be very interesting. Those obtained

om Buxton, at Blackpool, and at Manchester may be known at once. Those obtained near Buxton contained lime and were white, although on a wet day and at least a mile from the blasting of the rock. Those at Blackpool on the seashore, were remarkably clean; they were taken after rain. Organisms were not sought in free country air.

PRODUCTS OF DECOMPOSITION.

It is known that when organized bodies decomposed, more or less ammonia is given out. it ought, therefore to be found in the air. I have not yet determined the smallest amount of washings in which ammonia can be found. This will, however, be a mode of ascertaining the condition of air so far as decomposing matter is concerned, from which there will be no appeal. The amount of soluble salts of chlorine and sulphuric acid has often been examined, and differences have been found to a very great extent. Of the chlorine of the chlorides the smallest amount, in a certain measure, was 31·78 grains inland, that is at Buxton, Derbyshire, and the highest 312·5 in a manufacturing town where chlorides were decomposed. The inquiry has also shown that chlorides increase in the air when coal is burnt, even when there are no manufactures for specially decomposing chlorides.

The amount of sulphuric acid, free and combined, was found to vary from 75 to 4,000 in equal bulks. Some of the washings were rather laborious, as from 100 to 1,000 bottles were generally used for outdoor specimens.

By the use of this method we may be able to estimate the amount of sea air which comes to any region when it can be freed of the presence of coal, and by means of the sulphates we shall be able to tell the amount of decomposition. At least it seems to me the sulphates must come from decomposed matter, giving out sulphuretted hydrogen or its ammonia compound. I do not doubt that an equivalent of ammonia will often be found with the acid: but not always, since, by the experiments of M. Robierre of Nantes, the upper air contains nitrates and the lower air ammonia in predominance. Gernez has found sulphates in the atmosphere of Germany. They have been found in the rain at Darmstadt and vicinity, at Zwingenberg, and at Giessen, and at all places where sought. The remarkable point is their increase on land; there seems no reason for this except decomposition and coal burning. It seems too much to refer the whole to the fuel.

RAIN.

In the rain from the Hebrides (and the Atlantic, as collected by Dr. Carpenter as far north as the Shetlands), the sulphates diminished far

below the chlorides there; the rain partakes of the quality of sea-water. Still we require to account for the great ease with which the salts are diffused in the atmosphere; we do not yet know whether there is a power of separation. At the present experiments are against this, and lead rather to the belief that the rain contains actual sea-water with an addition of sulphates. Now, what is the origin of these sulphates? We should expect the great ocean to keep all the gases formed within it; but diffusion is rapid, and the spray is often high, so that opportunities of mixture must occur. Specimens of sea rain examined are too few to answer all questions that arise.

The mode of washing the air may be resorted to in examining ventilation and the air found in very dry places. When the examination is to be made out-of-doors, and in a country with a large rain fall, we have provided by nature a mode of air washing. Country rain and town rain are easily distinguished—at least the rain of places where much coal is burned; the one is clear and colorless, the other black and muddy; the one is tasteless, the other tastes of soot; the one is neutral, the other is acid and corrodes metals and even stones and bricks, destroying mortar rapidly, and spoiling many colors readily.

These common observations require only to be supplemented by the refinements of chemical experiment. This can readily be done, for the rain washes the air, and we find it purer. The impurity which goes into the water is easily taken out. The results are similar to those obtained by washing the air; the first and most striking is the sulphuric acid arising from the burning coal.

SPECIMEN OF RESULTS BY EXAMINING RAIN.

Hydrochloric Acid. Combined and Uncombined Chlorine. Relation to the average of that from Row, Dunbartonshire, taken as 100: Comparative quantities only.

Row, Dumbartonshire.....	100·00	1
Birkenhead.....	461·87	4½
Near an alkali work.....	495 83	5
Whiston [from covered tank.....	512·24	5
Newcastle on Tyne.....	1158·77	11¼
Manchester.....	1438·00	14½
Liverpool.....	1684·00	17
Waterloo (shore near do].	5214·30	52

Rain,—Sulphuric Acid. Relation to that from Row, Dunbartonshire, taken as 100.

Row, Dunbartonshire....	100·00	1
Waterloo.....	329·34	2¼
Whiston.....	398·28	4
Birkenhead.....	464·47	4½
Liverpool.....	706·02	7
Newcastle-on-Tyne	891·43	9
Manchester.....	973·00	9¾
Near an alkali work.....	1470·00	14

Rain.—Total Acid. Relation to that in Rain from Row, Dunbartonshire, which is taken as 100.

Row, Dunbartonshire.....	100·00	1
Whiston.....	470·69	4¾
Birkenhead.....	528·29	5¼
Liverpool.....	938·21	9¾
Waterloo.....	961·98	9¾
Newcastle-on-Tyne.....	1054·73	10¼
Manchester,.....	1272·54	11¾
Near an alkali work.....	1539.27	15¾

AMMONIA.

It is quite proved that there is more ammonia in inhabited than unin-

habited places. There will be less difference when there is much rain or much wind, or very great dryness. These conditions are in reality favorable to health, each with its peculiar exception and modifications. Liebig examined the Giessen rain; others have made similar examinations, but much yet remains to be done.

Rain waters collected during 1869.

	Ammonia Free, and with Acid. Parts per Million.
Darmstadt, February	5·30
Do. during a thunderstorm, May 26th	1·00
Zwingenberg, near Darmstadt, on the top of a hill, July	0·85
Heidelberg, Schlossberg, June 15.	0·40
Tyree, May	0.40
Kelly, Wemyss Bay, Clyde, south west wind, June 12th-15th	0·15
St. Helens, west wind, February 13th-March 11th	6·00
Do., much east wind, April 22nd May 26th	3·67
Manchester, 30 feet from the ground, August	1·50
Do., same place September	2·70
Do., 12 feet from the ground, back of Laboratory, April	18·00
Do., same place. August	4·20
Do., during a thunderstorm; rain had fallen heavily, just before, September 10th	0·84
Do., 2 feet from the ground, behind the Literary and Philosophical Society, 9th 31st Aug	9·09
Do. same place during Sept	2·80

The amount in Darmstdat seems high for a small place. The washing of the air by the rain is strikingly shown. The advantage of a slight elevation and distance from a town is shown at Zwingenberg; and at Schlossberg, on a slight elevation behind the town. The greater purity of sea air is shown on the coast at Wemyss Bay. No specimens were collected with greater care than those from Wemyss Bay. The above may be accepted as at least valuable comparative amounts. The differences in height are shown in Manchester. These experiments agree with those made at Vantes, by Robierre. The ammonia dininishes, whilst nitric acid increases, up to a habitable height. The Manchester specimens were behind houses, or in confined situations. By these means we may be able to to tell plainly and authoratively if a place is close or otherwise: and to say that the rain or the air when washed, must not show more than a given amount so as to be fit for respiration. In this way it may be possibly authorative to fix a limit to the density of the population and the extent to which manufactures may be carried on within a given area.

ALBUMINOUS MATTER.

We cannot, however, except that all the nitrogen of organic substances should pass into ammonia at once, especially as it has been shown that there are substances visible in the washed air. These may be in part nitrogenous bodies carried up: and if we decompose these, we shal obtain the ammonia. After obtaining the ammonia, by the Wanklye method, by boiling with carbonate of potash, we can apply his mode of

decomposing albuminous bodies mainly by the use of caustic potash, and permanganate, so as to obtain the ammonia resulting. We can thus to some extent analyse the organic matter of the air. If we treat the rain of various places in this manner, we have results corresponding to the density of population to some extent; but there will also be differences caused by currents, rates of decomposition, and washing. We have for example:—

Rain waters collected during 1869.	Albuminoid Ammonia. Parts per Million.
Darmstadt, February.....	0·30
Do., during a thunderstorm, May 26th.....	0·075
Zwingenberg, near Heidleberge, July.....	0·15
Heidelberg, June 15th.....	0·087
Tyree, May.....	0·30
Kelly, Wemyss Bay, southwest wind, June 2nd-15th.....	0·075
St. Helens, west wind, February 18th-March 11th.....	0·15
Do., April 23rd.....	0·20
Manchester, 30 feet from the ground, August.....	0·15
Do., same place, September.....	0·30
Do., 12 feet from the ground, Feb.	0·30
Do., same place, June.....	0·15
Do., During a thunderstorm. Rain had fallen heavily just before. Collected about 2 ft. from the ground, Sept. 10th..	0·079
Do,, 2 feet from the ground, behind the Literary and Philosophical Society, September....	0·25

We have here the amount of ammonia from substances decomposed by caustic soda and permanganate. Darmstdhansat and Tyree are both rather high. Darmstdhansat being a town, might be supposed to have cause sufficient. The Tyree specimen was, I believe well collected, as the inorganic salts were such as precluded the idea of all impurity of that kind; but some local cause may have affected it, such as the decomposing of weeds, as there is a large kelp work on the island.

NITRIC ACID.

A curious result is found in the case of nitric acid; the Continental rain contains much more than our rain, so far as the observations yet go. This is what might have been expected, because in a drier atomosphere there would be less nitric acid carried down, and in a warmer there would be more formed, if nitrification in the atmosphere requires the same temperature as in the soil. It is uncertain whether this is an accident or a common characteristic. In another point there seems a difference between the Continental atmosphere and ours. Pettenkofer finds 0·05 per cent. of carbonic acid in the free air at Munich, which is a town of wide and open streets, especially at the University. In the streets of Manchester a smaller amount is generally found. About 0·04 is the amount in tolerably open situations.

Rain waters collected during 1868.

	Nitric Acid per Million.
Darmstadt, February	8·894
Do., during a thunderstorm, May 26th	1·112
Zwingenberg, July	0·370
Heidelberg, June 15th	0·370
N. Uist, March	0·556
Kelly, June 12th, 15th	0·185
St. Helens, March 11th-April 22.	0·926
Do., April 23rd-May 30th	0·556
Manchester, 30 feet from the ground, August	1.482
Manchester, 12 feet from the ground, February	0.370
Manchester, 12 feet from the ground, July	1·668
Manchester, 20 feet from the ground, Sept.	0·741
Manchester, during a thunderstorm. Rain had fallen heavily just before. September 10	

The large amouut of solid matter in specimens of rain sent from Glasgow led me to connect it with the great mortality of that town. Steps are being taken to obtain specimens of rain in several towns for the prosecution of this branch of inquiry.

For a satisfactory investigation of the subject we must look to the multiplication of these experiments, and perhaps to the establishment of a department at some observatories for chemical climatology and meteorology.—*Journal of Scottish Meteorological Society.*

NOTES ON BIOGENESIS AND ABIOGENESIS.

By E. McClure, M.A.

The spontaneous generation question has been invested with an increased interest since the delivery of Professor Huxley's address at the late meeting of the British Association. The advocates of the opposing theories on the subject have started to work with renewed zeal to bring the matter to a definite issue. Professor Huxley and Dr. Bastian stand forward as the acknowledged leaders on both sides. The labours of the latter gentleman, who contends for the spontaneous generation, or abiogenesis theory, are certainly very zealous. His recent papers in "*Nature*" have won for him many partisans both here and in America. The *New York Medical Gazette* of the 5th of November devotes an article to the subject, in which there is exhibited a considerable leaning to the Abiogenesis theory. The experiments of Dr. Bastian upon sealed tins of preserved meat, and flasks containing organic matter, exposed for a lengthened period to a temperature as high as 300° Fahrenheit, seem of great weight to the writer of that article. The objections of Professor Tyndall, however, are impartially noticed, and the Editor calls for further and crucial experiments, in order that this important question may be settled. He thinks, however, that there are *a priori* considerations to encourage the supporters of the Abiogenesis theory. There must have been, he

maintains, a period—prior to the "origin of species," or the era of "natural selection"—when the first organic compound came into existence; and he is inclined to believe that this must have taken place by the "re-arrangement of the molecules" of inorganic matter, by the operation of physical forces under certain fixed conditions of which we are yet quite ignorant; and that this process is very probably going on around us still.

Dr. Cameron, in his "Report on Public Health," in the November number of the *Dublin Quarterly Journal of Medical Science*, after reviewing Professor Huxley's late address, states that Dr. Burdon Sanderson believes that the recent researches in this subject have established at least one fundamental doctrine—namely, that every kind of *contagion* consists of particles. The smallest organisms as yet discovered are of a spheroidal corpuscular form, called *micrococcus* by Hallier, and *microzymæ* by Béchamp. It may be interesting to give the former gentleman's opinions regarding their structure, a review of whose work appeared some time ago in the *Medical Times and Gazette*:—

"If, for instance, micrococcus gathers on the surface of the fermenting fluid, the newly-formed subdivisions of the parent cells remain in connection, forming links of a chain. In the same way, these chains may form in masses upon the mucous membrane of the mouth and pharynx, and pass, more or less broken up, through the alimentary canal, and may be found in large masses in the fæces. Remak gave these forms the name of Leptothrix buccalis; but since leptothrix is a kind of alga, I have preferred to call them mycothrix. In the same way, beautiful arborescent growths may be produced under certain atmospheric influences which have been called hormyscium, but which should rather be called the hormyscium form of micrococcus. In like manner, anthrococcus may present several varieties, which have been classified as oïdium, torlhansua, &c

"Micrococcus, cryptococcus, and anthrococcus are, therefore, not separate species, but merely morphæ, or forms representing stages in the growth of different fungi, which, however similar they may be to each other, never lose their specific characters. A fact of the utmost value in the study of vegetable parasites is that we are enabled to make each yeast-cell bud and develop, if we place it on an appropriate solid soil and provide it with filtered air.

"In the blood and tissues of the human body, rich in nitrogen, of course, the micrococcus of fungi alone is to be found. Anthrococcus is, however, frequently found on the surface of the mucous membrane of the mouth and stomach, whilst cryptococcus is sometimes met with in the contents of the stomach after certain kinds of food have been taken. When the

micrococcus of any fungus occurs in large masses in the blood of man, it may generally be looked upon as a pathological indication. I have, however, occasionally found the micrococcus of Penicillium crustaceum in the blood of perfectly healthy people. At all events, the occurrence of micrococcus in blood can only be considered as of any real pathological moment when it is known from what fungus it proceeds.

"The micrococcus cells are generally so small that they require to be magnified 2,000 diameters to be examined, as they do not present distinctive characters. The fungus from which they have been derived can only be determined by cultivating them. I have succeeded in finding the micrococcus of certain fungi in a considerable number of diseases, and have always found one form peculiar to one and the same disease. To develop the fungus, in each case a supply of filtered air and a solid substratum are necessary, as mentioned above. Under these circumstances, the micrococcus gradually enlarges, until the cells reach about the diameter of the respective fungus. These large translucent cells, which have been named "sporoids," are capable of budding."—*Journal of Cataneous Medicine.*

THE LIVER THE SEAT OF FORMATION OF UREA.—The latest researches upon the place of origin of urea, and especially the beautiful experiments of M. Grehant, have demonstrated that the kidneys are by no means secretory, but purely excretory, organs for urea. Dr. Cyon, in the last number of the *Central blatz*, published a few facts in the form of a provisional communication, to show that it is probably produced at the liver. The plan of experimentation adopted (in common with M. Istomin) was as follows: The whole of the blood was abstracted from the carotid of a dog, and a portion, after being defibrinated, was transmitted by means of mercurial pressure through the liver. Coincidently three canulæ were introduced—one into the inferior vena cava, the second into the hepatic artery, and the third into the vena porta. The results of careful analysis showed that the blood which had passed through the liver contained a much larger proportion of urea than ordinary arterial blood. In one experiment 100 c. c. of the arterial blood when defibrinated contained 0.08 grammes of urea; but after having been passed four times through the liver, the same quantity contained 0.176 grammes.—*Lancet.*

Canada Medical Journal.

MONTREAL, APRIL, 1871.

SMALL-POX—ITS PROBABLE ADVENT.

For some months past the City of Montreal has been free from that scourge Small-pox. How long we are to remain so is questionable. A case, the first of the kind, was admitted into the Montreal General Hospital recently. The patient was a passenger by the steamship "Scandinavian" on her last trip to Portland, and, so far as we could ascertain, he must have contracted the disease before leaving Liverpool. We are aware that Small-pox of a very severe type exists in some quarters of the city of Liverpool, and we may fully expect any number of cases with the tide of emigration..

In conversation with a *confrere* the other day, he suggested the idea of shipping agents insisting on vaccination being performed on all passengers, prior to embarkation for this country; this we do believe a good suggestion if it could be carried out, and would be very beneficial, both to the owners of vessels as well as to the individuals emigrating. Sir James Simpson, in a paper which he published shortly before his last fatal illness, suggested universal vaccination, adult and infant, with a view of "stamping out," as he termed it, the disease, Small-pox.

With regard to the protective influence of vaccine, we think that no man of sound and disposing mind would entertain a doubt on this head. From the observations of Ganster and others it has been proved that the protective influence of vaccine diminishes every year after the fourteenth, dating from its performance, so that it becomes a settled axiom that re-vaccination of adults is a wise precautionary measure, in view of a threatened epidemic of Small-pox.

It is a fact that Small-pox is more or less epidemic throughout Europe; all the large seaport towns suffering from the disease in variable intensity, it becomes the duty of the Government to issue special regulations with regard to careful quarantine. No vessel coming from an infected port should be permitted to pass the quarantine station; if a single case of Small-pox has broken out on board during the passage, without careful ventilation, fumigation and cleansing. All vessels should be obliged to stop at the quarantine station, or all the

passengers should be carefully inspected by a medical officer prior to permitting them to pass up to Quebec. No exemption should be made in the case of steamships. The delay may occasion some inconvenience to importers; but that delay should not be for a moment thought of when compared with the fearful consequences of introducing into our country, by direct contact, so fearful a scourge as Small-pox.

It is a settled fact that Small-pox has a distinct period of incubation. The disease consists in a specific poison, which, on entering the circulation, gives rise to a train of symptoms more or less severe, according to individual peculiarities. The period of incubation is stated to be twelve days, that is, dating from exposure to the commencement of the attack. This period of latency is unattended with symptoms o indisposition. About the twelfth day after exposure the individual shows the first indication of the disease, and three days thereafter the eruption commences to appear. It is our own experience, and we believe the experience of most physicians, that vaccination, if properly performed, will, even though the poison of Small-pox is already in the system, have a modifying influence. This fact is, perhaps, the strongest argument in favor of re-vaccination; and, with regard to the suggestion that all passengers should be vaccinated, or re-vaccinated, prior to embarcation, we believe that, if shipping agents would rigidly carry out this rule, much good would result, and there would be less chance of their vessels being detained in quarantine for variable periods, extending in some instances over several weeks.

With regard to universal re-vaccination, we have always recommended it, and practised it when requested to do so. The trouble and inconvenience is trifling; no possible harm can accrue; much good may, however follow, more especially in a large community, among whom there must be many who are not protected, and who, by submitting to a trifling operation, not more painful than the scratch of a pin, and a few days uneasiness, place themselves in the very best possible condition of resisting the poisonous influence of a most loathsome disease, which, in all likelihood, will become epidemic in spite of the utmost care to prevent such a catastrophe.

ANNUAL CONVOCATION McGILL UNIVERSITY.

The Annual Convocation of this University was held in the William Molson Hall, on Friday, the 31st March, 1871, for conferring degrees in Medicine and Surgery, and Law.

The proceedings were opened with prayer by the Venerable Archdeacon Leach, D.C.L., LL.D., the Vice-Principal.

The Dean of the Medical Faculty, George W. Campbell, A.M., M.D., made the following announcement:—

The total number of students in the past session was 150 (an increase of 10 over the preceding session) of these there were from the Province of Ontario, 78; from the Province of Quebec, 61; Nova Scotia, 4; New Brunswick, 1; Newfoundland, 2; Prince Edward Island, 2; United States, 2.

The number of students who passed their Primary Examination, which includes Anatomy, Chemistry, Materia Medica, Institutes of Medicine, and Botany or Zoology, was 26; as follows:—

Hamilton Allen, Alex. D. Blackader, B.A., Arthur A. Browne, George M. Christie, William Copeland, Daniel C. Cram, George M. G. Farewell, George W. Gernon, John R. Hamilton, Zotique Hébert, Harry Hetherington, Robert Howard, Samuel N. Jackson, Thomas Kelly, Albert E. Mallory, Louis T. Marceau, Peter McLaren, James T. Monroe, John Morrison, B.A., William R. Nicol, William J. Sharpe, Leonard St. John, George A. Stark, Alexander Stewart, A. Dixon Wagner, William E. Waugh.

The number of students who passed their final examination for the degree of M.D.C.M. was 29. Of these, 16 are from Ontario, 9 from Quebec, 2 from Nova Scotia, 1 from New Brunswick, and 1 from Newfoundland.

Their names, and subjects of their theses, are as follows:—

R. A. Alexander, Urinary Calculi.
L. H. Beaudry, Pathology of the Secretions.
Alexander D. Blackader, B.A., Common Sensation.
H. R. Brissett, Diseases of the Heart.
A. J. Cattenach, Morbus Coxæ.
W. Clarke, B.A., Acupressure.
F. F. D'Avignon, Strabismus.
G. M. Duncan, Chloral.
John Duncan, Calculus Vesicæ.
G. W. Faulkner, Dysentery.
C. M. Freeman, Diabetes Mellitus.
M. Gardner, Typhoid Fever.
J. R. Hamilton, Talipes Varus.
L. G. Hunt, Tubercular Meningitis.
T. G. Johnston, Diabetes Mellitus.
H. McConkey, Erysipelas.
C. F. A. Locke, Dyspepsia.
G. W. Major, B.A., Enterorrhœa Infantum.
Alonzo W. Marston, Circulation of the Blood.
J. H. Mathieson, Surgical Cases.
F. H. Mitchell, Scarlatina.
C. J. Rattray, Venereal Diseases.
T. D. Reed, Pneumonia.
J. A. Reid, Vivisection.
W. G. Ross, Typhoid Fever.
R. Stevenson, Post Partum Hæmorrhage.
F. Warren, Debility.
J. F. S. Webb, Neuralgia.
H. P. Wright, Intermittent Fever.

Of the above-named gentlemen, four have not completed their twenty-first year, and cannot therefore receive their diplomas at the present convocation. Their names are Messrs. Locke, McConkey, Warren, and Wright. They have, however, passed all the examinations, and fulfilled all the other requirements, and only await their majority to receive the degree.

The Medical Faculty prizes are the Holmes Gold Medal, awarded to the student who takes the highest marks in the aggregate of primary and final graduation examinations, and Thesis; and two prizes, one for the best final, and one for the best primary examinations.

The Holmes Medal was gained by John H. Mathieson, Embro, O.

The prize for the best examination in the final branches was awarded to H. P. Wright, Ottawa, O., and in the primary branches to T. Kelly, Durham, O.

The gentlemen who, after the prizemen, passed the best examination in the final branches, were Messrs. R. A. Stevenson, T. G. Johnson, W. Clarke, B.A., A. W. Cattanach, C. F. A. Locke, W. G. Ross; and in the primary branche, H. Allen, L. T. Marceau, G. A. Starke, A. A. Browne and W. Copeland, in order of merit.

PROFESSORS' PRIZES.

Zoology—Prize, M. D. Stark.

Practical Anatomy—Senior class prize, J. Hils; junior class prize, Messrs. J. B. Comeau and Ellison, equal. Senior class deserving honorable mention, Messrs. Alguire, Kitson, Carmichael, Ward; junior class deserving honorable mention, Messrs. Chevalier, Young, Rattery and Molson.

Practical Chemistry—Prize, C. Sheppard.

The graduates were then called up, and after the oaths had been administered by Dr. Craik, the ceremony of capping was performed by Dr. Dawson, Principal, who presented each with his diploma.

Dr. Stevenson then delivered the valedictory address on behalf of the graduating class.

Professor Fenwick addressed the graduates in Medicine and Surgery on behalf of the Faculty. This address will be found among our original communications.

After the proceedings of the Law Faculty, the benediction was pronounced by the Rev. Professor Cornish and the convocation adjourned.

COLLEGE OF PHYSICIANS & SURGEONS OF ONTARIO.

Written Examinations for the year 1871, beginning Tuesday, April 4th, at 9 a.m.

CHEMISTRY. Dr. Sangster.

State clearly the course of the Electric current in a galvanic battery, and which is the positive and which the negative Electrode.

Describe the Thermometric scales, and state how readings in one may be reduced to equivalent readings in the others.

Describe the nature, sources, properties and uses of ozone, also mode of detecting its presence and amount.

Distinguish between colloids and crystalloids, giving examples.
Give general rule for calculating the Sp. gr. of gases of known composition.
Give brief synopsis of the chemistry of Fe. and its compounds.
Distinguish between Monads, Dyads, Triads, &c., with examples.
State the differences between Rectified Spirits, Proof Spirits, and absolute Alcohol, stating how the last may be obtained. Give the name and composition of a few of the Conatomic Alcohols of the series.

ANATOMY. Dr. Sullivan.

How would you expose the fornix? and describe it.
Trace the 3rd division of the 5th nerve from its origin, its branches, and sum up the parts supplied.
Name in order the parts exposed in removing the Trapezius Muscle.
How are the portal and internal Jugular veins formed? course and relations.
Describe the iris, membrana tympani and Velum interpositum.
Describe the duodenum, its relations; with vessels and nerves supplying it.
Dissect the plantar arch.

PHYSIOLOGY. Dr. Covernton.

What are the conditions necessary for the perception of taste? What nerves exercise the special sense? Describe their origin and distribution, and give a brief account of supposed mechanism.
Describe the auditory apparatus, origin and distribution of terminal filaments of auditory nerve, also functions of external and middle ear and Labyrinth.
Origin, distribution, function and inter-relation of great sympathetic with cerebro-spinal nerves.
What are the functions of medulla oblongata and mesocephalon as nervous centres?
Arrange the cerebral nerves according to their several functions, viz.: nerves of special sense, common sensation, motion, and mixed nerves.
Relate the peculiarities of the fœtal circulation.
Where are the Wolffian bodies situated and what are their functions?

MATERIA MEDICA. Dr. Tuck.

Name the chief medicinal agents classified as diuretics, state the purposes for which they are employed, and write a prescription in full that will have a direct diuretic action.
Give the medicinal properties, uses, doses, and modes of administration of Iodine, Belladonna and Aconite.
Name the pharmaceutical compounds of Lead, their uses and doses, poisonous effects and antidotal treatment.
Distinguish between narcotics and hypnotics; anæsthetics and anodynes, with examples of each and their peculiar physiological effect.

TOXICOLOGY. Dr. Sweetland.

What is a poison?
What are the symptoms of arsenical poisoning? Give the antidotes and reason why they are antidotes.
Give tests for corrosive sublimate.

Contrast the symptoms of poisoning by opium with those of apoplexy and intoxication.

What treatment would you adopt in narcotic poisoning.

In a case of suspected poisoning, what precautions would be necessary to observe in making post-mortem examination?

BOTANY. Dr. Cornell.

What is Botany?

Of what does the vegetable kingdom consist?

What does the term "plant" imply?

Are there any examples of plants growing without being attached to any fixed body? if so, give examples.

Are there any plants endowed with sensibility? if so, give examples.

What analogy is there between plants and animals?

What important position does the vegetable kingdom occupy?

Is there constantly any reciprocity of favors going on between the vegetable and animal kingdoms? if so, give examples.

SURGERY, other than operative. Dr. Lizars.

Describe the causes, symptoms and diagnosis of lumbar abscess.

Describe causes, differential, diagnosis and treatment of orchitis.

Describe the diseases which may demand castration.

What are the diseases which may affect the antrorm of higmore?

Describe the symptoms of membranous croup and cases in which trachœotomy is justified.

SURGICAL PATHOLOGY. Dr. Field.

What are the four principal conditions necessary to the normal nutrition of parts?

What are the two chief forms of atrophy? Describe an atrophied muscle in each form.

Describe the pathological changes that take place in the formation of an abscess also the process of repair or filling up the cavity produced by the discharge of pus.

Enumerate the products of inflammation that exude from the blood-vessels of inflamed parts.

In subcutaneous injuries does extravasated blood take any part in the reparative process? if it does, in what manner?

is the nominal mode in the repairing of fractures by ensbreaking or intermediate lattus? Describe the reparative process in fractures.

What experience in pathological conditions between dry and moist gangr Give causes in both forms.

OPERATIVE SURGERY. Dr. Lizars.

Describe two or more methods of vaccinating a child, and the changes that may be expected to occur if the vaccination is successful.

Describe the operation for deligation of the subclavian artery in its external third, the structures to be divided and the parts to be avoided.

Denote the different degrees of rupture of the perineum (female) causes and modes of operating for the relief thereof.

Describe the usual cause of vesico-vaginal fistula and describe the operation for its relief.

Describe Perrigoff's modification of Syme's operation at the ankle joint.

Describe the operations of Iridectomy.

Describe the operation of resection of the knee joint, and mention the cases in which it would be most likely to be successful.

A child is brought to you with double harelip and cleft soft palate, when should you attempt to relieve it? and the reason for selecting the period, and describe the operation that would be necessary.

OPERATIVE MIDWIFERY. Dr. Hope.

If the fœtus and pelvis are duly proportioned, but the position of the child unpropitious, what instruments should be used to restore the lost relation of position?

Give three cases where the use of the forceps is indicated, and describe the proper position of the patient for the operation, the manner of applying the instruments and of making extractive force.

Describe a case where craniotomy is indicated and the manner of performing the operation.

Give diagnosis and treatment of a case of epileptic puerperal convulsions.

State diagnosis and treatment of prolapsus of the cord.

MIDWIFERY, other than operative. Dr. Hope.

State some of the signs which show that labor has commenced.

How would you distinguish true and false pains?

Into how many stages is labor divided? Describe the several stages.

Describe the first and second positions of the head.

What is the best position for delivery?

GENERAL PATHOLOGY. Dr. Wright.

History of Tubercle—

What conditions form passive congestion? What are the structures involved and what are the general rules for treatment?

SURGICAL ANATOMY. Dr. Sullivan.

What is the relation of the parts passing beneath the anterior annular ligament of the wrist joint?

What parts are divided in excision of the elbow joint?

Give course and coverings of femoral hernia, where the stricture generally occurs, and the dangers likely to be encountered in dividing it.

How would you perform Symes' operation? and mention in some order all the structures divided.

Give course and relations of internal maxilary and obturator arteries.

MEDICAL JURISPRUDENCE. Dr. Campbell.

Give signs of death and give the order of the phenomena by which death is recognized.
Distinguish between wounds inflicted before and after death.
How are stains of human blood recognized?
How far may concussion of the brain be distinguished from intoxication?
Give the signs of pregnancy.
Give signs of recent delivery.
Describe the hydrostatic test in infanticide.
Give definition of insanity.
Different forms of insanity.
How can fevered insanity be recognized?

PRACTICE OF MEDICINE. Dr. Wright.

What are the symptoms of pneumonia in the adult, its several stages and their pathological conditions, the prognosis and treatment?
What circumstances are necessary to the production of malaria? What diseases does it give rise to? How would you prove the existence of such a cause of disease? What characters have they in common? and what effects follow their long continued influence?
The symptoms of acute and chronic Bright's disease, the rules for the detection of albumen and their fallacies, prognosis, and treatment.
What diseases of the chest have increased resonance on percussion? In what is percussion unaffected (or only slightly); and in what is it dull and what is it flat? and what value is percussion as a means of diagnosis, and how is percussion performed?

SANITARY SCIENCE. Dr. Carson.

What is Sanitary Science?
What sanitary measures should be enforced by the public authorities at all times?
What measures should be adopted in anticipation of an epidemic of cholera? In small pox?
How far may the endemic diseases of Canada be prevented, and in what way?
What are the ordinary impurities of drinking water, and how may they be detected and removed?
In making out a dietary scale for a jail or asylum what proportion of nitrogenous food should be daily allowed for each inmate?
Give an example of a daily ration for an adult prisoner on the cheapest scale compatible with health.
What is the minimum cubic span that should be allowed to each bed in an hospital or barrack?
Name some of the ordinary disinfectants and how they are supposed to act.

SUCCESS OF A McGILL COLLEGE STUDENT.

We have much pleasure in announcing the success of another Graduate of McGill College, in Great Britain.

G. W. BLIGH, M.D., C.M., L.R.C.S.E., and late Assistant-Surgeon in the United States Army, has received the appointment of House Surgeon to the Kidderminster Infirmary, one of the best appointments of the kind in England.

His election and appointment, which took place on the 8th of December last, and resulted in an unanimous choice, was contested by a large number of candidates, among whom were many able men who had held good surgical appointments in different parts of England, including two ex-house surgeons of Charing Cross Hospital, and one of University College, London.

This institution, although styled an Infirmary, is in reality an hospital, although out-patients are attended at their homes, when too ill to be removed, or unable to be admitted into the Institution. A very fine new building is in course of erection, the memorial stone of which was laid last spring by the Countess of Dudley, and will be completed and ready for occupation by the end of May next. It is fitted up in the best style of art, with all the latest hygienic improvements and detached fever wards, &c., &c.

Dr. BLIGH'S professional opportunities have been of the very best kind. The late fratricidal war in the United States of America opened a splendid field to young surgeons, of which he was not slow to avail himself. The influence and interest which he commanded secured him the greatest respect and consideration of many of the leading surgeons of the U.S. Army; and his taste, inclination, and mature judgment—then a very young man not twenty-one years of age—soon placed him in the coveted position usually assigned to older and more experienced hands—operating surgeon. He was sent to the front, where he laid the foundation of his future successful career. His field and hospital operations count by hundreds, and that of excision of the shoulder joint he has performed eighteen times in that service. His testimonials from the U.S. Army form an honorable and bright record, and are the surest vouchers of his future distinction. We wish him the success we are confident awaits his superior attainments and abilities, notwithstanding his extremely retiring disposition.

Dr. BLIGH is a nephew of Dr. MARSDEN, of Quebec, by whom he was educated, and under whom he studied. The latter gentleman was,

in addition to his other professional honours, admitted as a Corresponding Fellow of the "Edinburgh Obstetrical Society" on the 13th of July last, on motion of Dr. C. BELL, the President, seconded by Dr. KEILLER.—*Communicated.*

THE PROFESSION IN TORONTO.

The profession in Toronto met in considerable numbers on the 8th of March, and passed a series of resolutions on the existing state of medica matters in the Province of Ontario; the two following were the most important:—

3rd. "That we will not support any candidate who will not agree to modify the law under which the profession of Ontario is at present incorporated, at least so far as to bring its Council and Examining Board in conformity with the provisions of the contemplated Medical Act for the Dominion of Canada."

4th. "That we further urge upon medical men the desirability of requesting candidates to advocate a repeal of the Ontario Medical Act, which unites us with persons known as Homœopaths and Eclectics."

We need hardly add that we cordially endorse the action of our brethren in Toronto, and sincerely trust that the stand thus taken may influence at least some of the recently returned members. If the profession of Ontario, however, really wish to place themselves right before the medical world, they must act unitedly.

PRACTICE FOR SALE.

Any young medical man, desirous of at once entering upon a good country practice, where there is no opposition, is referred to our advertising columns. We know the medical man who offers his practice for sale, and are aware that ill health is alone the cause of his relinquishing it.

We trust that our Canadian Medical Association is not going to be unrepresented at the forthcoming meeting of the American Medical Association, which takes place in May, at San Francisco, California.

Medical News.

DR. N. G. ORDWAY, of Portland, Maine, who was sued for malpractice in the matter of an operation performed upon a patient's hand, has received a verdict in his favor on the singular defence, as reported by a local paper, "that the ether used in the operation affected the physician so that he was unconscious of what he did."

DEATH FROM CHLORAL HYDRATE.

DR. GEORGE G. NEEDHAM reports in the *Journal of Psychological Medecine* a case of fatal cerebral congestion following the administration of Hydrate of Chloral to a married woman, aged 50 of hysterical diathesis, who had suffered for some two years with symptoms of mental derangement, consisting of distressing "nervousness," fear of impending death, hesitation, suspiciousness, etc. Ophthalmoscopic examination showed an enlarged and tortuous condition of the retinal vessels. In October, 1870, the loss of a relative threw her into a state of much excitement, for which she took, on October 19th, 115 grains of bromide of potassium. On the 21st, chloral hydrate was prescribed in thirty-grain doses, of which she took six, as follows:—On the 21st, at 5.30 p.m. and 11 p.m.; on the 22d at 10 a.m. and 3 p.m.; on the 23d, at 1 a.m., 8 a.m., 8.10 a.m., and 1.30 p.m. On the afternoon of the 22d she was sleeping quietly, with a somewhat rapid pulse, and was found in the same condition at two visits (morning and evening) on the 23d. On the morning of the 24th her continued sleep created alarm, and ineffectual attempts were made to rouse her, which were maintained during the day and night. Sulphate of strychnia was thrice injected in doses of one thirtieth of a grain at intervals of four hours during the night. Coma progressed to a fatal termination on the afternoon of the 25th. The autopsy revealed extreme hyperæmia of the pia mater and brain substance. A year before the patient had taken nearly the same quantity of chloral within the same period of time without ill effects. The writer suggests that the previous administration of a long course of bromide of potassium may increase the danger of full doses of chloral.