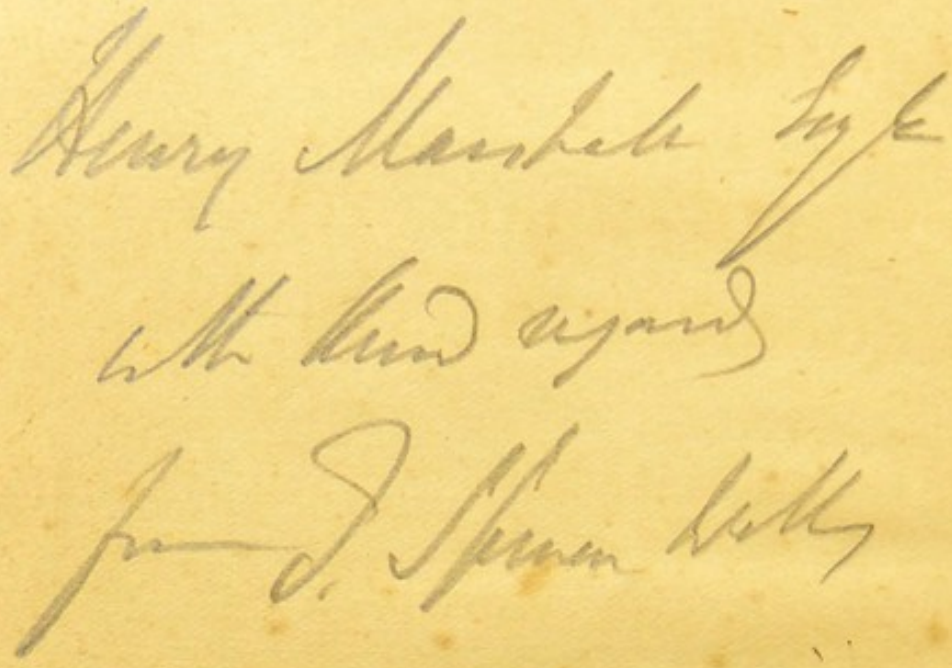
Surgery, past present and future ; and Excessive mortality after surgical operations : two addresses to the British Medical Association 1864 & 1877 / by T. Spencer Wells.

TWO ADDRESSES

T. SPENCER WELLS



SURGERY

PAST PRESENT AND FUTURE

AND

EXCESSIVE MORTALITY

AFTER SURGICAL OPERATIONS

TWO ADDRESSES

TO THE

BRITISH MEDICAL ASSOCIATION 1864 & 1877

BY

T. SPENCER WELLS F.R.C.S.

SURGEON TO THE QUEEN'S HOUSEHOLD PROFESSOR OF SURGERY AND PATHOLOGY
TO THE ROYAL COLLEGE OF SURGEONS OF ENGLAND ETC.

LONDON

J. & A. CHURCHILL NEW BURLINGTON STREET

1877

TO THE

PRESIDENT AND MEMBERS

OF THE

BRITISH MEDICAL ASSOCIATION

THESE ADDRESSES

ARE RESPECTFULLY DEDICATED

ADDRESS IN SURGERY.

Delivered at Manchester on Thursday, August 9, 1877.

Mr. President and Gentlemen —

When I received from the President of the Council of this great Association the unanimous request of the Committee of Council that I would deliver this Address, and was further assured that I was thus invited at the suggestion of a deputation from Manchester, I felt that any hesitation on my part might appear ungrateful, or as if I did not appreciate a great honour. So, without wasting your time by apologies, and simply thanking you for the exceeding kindness of your greeting to-day, I will ask you to consider with me how, as an Association, how in each of our branches, how, individually as well as collectively, every one of us may assist in the advancement of the

SURGERY OF THE FUTURE;

how the art and science of the present, which we have received from our forefathers and our teachers, and as far as we could have improved, may be so handed down that our followers, taught by our success, warned by our failures, knowing where our knowledge is defective, our methods faulty, may so work and so observe that in each succeeding year surgery may become more perfect as an art, more exact as a science, and more honourable as a profession.

It is almost impossible to estimate the state of surgery of the present day, still more so to look forward to what surgery

may become, without some review of its condition long ago and of the progress made during the existence of this Association.

It is one of the remarkable coincidences of English history that the reigns, nearly equal in duration, of the two Queens, Elizabeth and Victoria, have been the two ages most distinguished by the rapidity and extent of national development. Elizabeth mounted the throne after the death of her sister Mary, accelerated by disappointment at the termination of supposed pregnancy in dropsy, which was no doubt ovarian, and, treated according to ignorant routine by successive bleedings. Treated with the knowledge now at command, the destinies of England might have been strangely altered. (*Note* 1.) Elizabeth reigned forty-five years, and in her time, surgery, though already chartered as a profession, was neither an art nor a science. For the most part it was carried on as a trade, after the fashion of the country farriers of our day. Indeed, it was unanimously agreed by the Queen's Commissioners that it was unlawful for surgeons to administer internal remedies even in cases of wounds. (*Note* 2.) 'Bokes of Chirurgerie' were collections of sayings and nostrums. Life was rude, living was unwholesome, and death came early. The people perished by scurvy and sweating sickness; they were killed or scarred by small-pox; their blood was poor, and the barbers bled them. Fighting-men began to suffer from gun-shot wounds, and their blood gushing from arteries cut in hacking amputations, was staunched by 'choke-bands,' by boiling pitch, or by hot irons. The first impulse towards improvement came from Ambrose Paré. But men long looked suspiciously on his new practice of tying bloodvessels in amputations. And so as an art surgery—an exception to the general progress—stood almost still, even long after Harvey's great discovery, and scarcely any important advance, beyond such manual dexterity as that of Cheselden, was made until the time of Hunter. His noble work is thus epigrammatically acknowledged by the philosophical Malgaigne:—'Surgery, which in the Middle Ages scarcely ranked above a common trade, and grew to be honoured as an art in the hands of Paré and Petit, was raised by Hunter to the dignity of a science.' (*Note* 3.) What it has become since, and is now, we may perhaps best see by rapidly tracing its development parallel with the history of

our Association, which may almost be said to be the offspring of the age of Victoria.

Before this Association was founded the daily practice of surgery was guided by a knowledge of what Hunter and Scarpa had done as to the ligature of arterial trunks. Resection of joints had been frequently though not commonly performed. Bell's teachings of the different nerve-functions had been universally accepted. Auscultation and percussion had been gradually perfecting diagnosis among those who were then about entering into practice. The vegetable alkaloids were beginning to take the place of the coarser materials previously used as remedies. Almost coincidently with the formation of this Society, in 1832, there began to be spoken about vaguely, and as curiosities, things which are now so universally practised that probably very few of those who listen to me recollect how very recently they have been accepted as part and parcel of surgical practice. I am not one of the oldest here, but I can well remember when lithotrity was a novelty, when the subcutaneous section of tendons was absolutely new, when orthopædic surgery was unknown, when the torsion of arteries was spoken of as a barely possible substitute for the ligature, when the radical cure of hernia was scoffed at as a French delusion, when the treatment of aneurism by compression had hardly even entered into the professional imagination, and the study of uterine pathology was only just opened up by the introduction of the speculum as a means of investigating the condition of the mouth and neck of the uterus.

In 1832, when it was resolved to form this Association, and at the succeeding meetings in 1833 and 1834, all these things were new and almost untried. In 1835, at Oxford, Costello publicly demonstrated lithotrity as a novelty before the assembled members, and I think we may fairly date the establishment of that operation, now so carefully and generally practised by so many of our associates, from that meeting. (*Note* 4.)

In 1836 the Association met for the first time at Manchester. Crosse, of Norwich, was the first surgeon to give a retrospective address. In it he mentions as a recent discovery that of the trichina spiralis by Owen. He makes the first notice of the chloride of zinc in cancer, and doubtingly hopes that the use of the speculum even in this country may become general. He

states that in this year there is the first known example in Great Britain in which both mother and child were saved by the Cæsarean operation, done by Knowles of Birmingham.

And here for a moment let me ask you to recall to mind the man who forty years ago was speaking to the Association as I now speak, not with his power, but to an audience enormously increased in numbers and influence. Crosse lived till 1850. I did not know him personally, but friends of mine who did speak of him as a man upright in character, earnest, natural, joyous, communicative, a fellow-worker with his pupils, of intense and untiring energy, priding himself upon gaining a most exact information of the progress of surgery, self-reliant, rapid in judgment, ready in action, calm and dexterous as an operator, yet with a strong conservative tendency as regards the knife, and most scrupulous in his attention to even the minutest details in the management of his cases. A clear and accurate writer, an industrious contributor to periodical literature, the good he did lives after him, especially in the impetus which he gave to the study of the direction, sanitary condition, and improvement of hospitals.

After Crosse, the next retrospective surgical address was by James, of Exeter, in 1839. In this he alludes, as a great novelty, to the fact that a member of our Association, Jeaffreson, of Framlingham, had successfully extirpated an ovarian cyst through a small incision; and also mentions that King, of Saxmundham, had repeated the operation on another patient with an equally good result. In 1840, at Southampton, Dodd, of Chichester, in the address on surgery, gives an account of the recent experience of Dieffenbach and Liston in operating for strabismus as something new, and reports that lithotrity does not seem to make any great advance in the favour of the profession in this country; and in 1843, at Leeds, William Hey said that 'the rage for dividing muscles and tendons is somewhat moderated.' In his own words, 'The past year has been signalised by the successful performance of several operations for the removal of ovarian tumours from the abdomen. Dr. Clay, of Manchester, has recorded five cases, of which three were successful, and Mr. Walne, of London, one successful case.' The William Hey who gave this address on surgery was the third in the line of the

great family, the head of whom was president of the meeting. Owing to his advanced age, the general address was read for him, and he died in the course of the following year. As a pupil of the Leeds infirmary forty years ago, I well remember the careful teaching and painstaking kindness of William Hey, jun., as he was then called. The name of Hey stood almost as high in Yorkshire as those of Abernethy and Cooper in London, and one of the family, Richard, grandson of the president, and for many years surgeon to the York County Hospital, almost simultaneously with Abernethy tied with success the common iliac artery for external iliac aneurism. The surgeoncy of the Leeds Infirmary has been held in the same name for 106 years, and descendants of the third and fourth generation are members of the present Staff. Worthy representatives of the great family to which they belong, they still maintain the high reputation of the surgery of the North. Another well-known member of a noted family of Yorkshire surgeons, Thomas Pridgin Teale, read the address at Sheffield in 1845. He alludes to the treatment of aneurism by compression, as indicating a great advance in the science of surgery. He notices Key's modification of herniotomy by dividing the stricture outside the sac as gradually assuming the position in the estimation of the profession to which it is entitled.

We now come to what will ever be looked on in future time as the commencement of a new era in surgery. In 1847, at Derby, Walshe, of Worcester, introduces for the first time the subject of anæsthesia, Crosse remarking that the inhalation of sulphuric ether was a subject of deep importance and great novelty. Your hourly familiarity with the use of anæsthetics of various kinds will make it difficult for you to realise the fact that it is only thirty years since Crosse spoke before this Association of the inhalation of ether chiefly as a means of disarming *a patient of his antagonism.* The first considerable essay on anæsthesia, and anæsthetic substances generally, was published in our transactions in the following year by Nunneley of Leeds. That was in 1848, and in the same year, at Bath, chloroform was for the first time publicly mentioned before this Association. In a review of the history of surgery in the reigns of Elizabeth and Victoria, there is no brighter page than that which records the discovery of anæsthetics, and not one in which

the contrast is more strikingly in favour of the practice of our day. Anæsthesia in midwifery met with more opposition than in surgery, and there must be many here who know well how much was done by the personal example of our own Queen towards allaying groundless fears and disarming irrational prejudice. National vanity may be more flattered by some public deeds of royal devotion; but I cannot call to mind a stronger proof of moral courage, of wiser consideration for the interests of her subjects, nor any act which, in the personal relations of the Queen to her people, demands more respectful recognition from the profession, or has a stronger claim on national gratitude.

In 1854 the Association met for the second time at Manchester; its 22nd anniversary meeting. Instead of 7,000 members, as now, there were but little more than 2,000. Instead of the large attendance so hospitably welcomed this week, only 202 members attended.

The surgical address in 1856 at Birmingham, by Langston Parker, should be remembered as a judicial summary of what was known of the treatment of cancer by caustics.

In 1857, at Nottingham, your Manchester Southam read the address on surgery, limiting himself to the subject of cancer and its treatment. Many of you knew Southam better than I did, but sitting with him in the Council of the College of Surgeons, and joining in the friendly gatherings which follow some of those meetings, I learnt to appreciate his sterling straightforward honesty, his kind genial character, and his ardent love for our profession and its work. And I can fully endorse all that was said of him by Sir James Paget in his obituary notice of the deceased Fellows of the Medico-Chirurgical Society, and acknowledge with extreme interest all that Sir James said as to Southam's services in the early days of ovariotomy in England.

Passing on to the Edinburgh meeting in 1858, it was then that we heard for the first time of local anæsthesia. Here also the subcutaneous injection of narcotics was brought under notice by Alexander Wood, who stated that even then the practice, although but lately introduced, was becoming general in Edinburgh; and recent improvements in the treatment of vesico-vaginal fistula were described to the Association by Mr. Baker

Brown. Sims's speculum and wire sutures were then unfamiliar; though they are now acknowledged to rank among the chief of the improvements for which we are indebted to our American brethren. Baker Brown was one of the first to adopt and afterwards to modify the proceedings of Sims. Brown had previously done good service by demonstrating the mode of curing old ruptures of the perinæum, and his example undoubtedly assisted in the improvement of this department of surgery. As an operator he was almost perfect, and he was one of the earliest London surgeons to practise ovariotomy. Many years afterwards he extended the use of the cautery-clamp (employed by Clay of Birmingham to divide adhesions and stop bleeding from omental vessels) as a mode of separating and securing the pedicle. May I be excused if I venture to remind you that in 1861, at the Canterbury meeting, I brought before the Association a paper on the treatment of ovarian cysts which others have said had some influence in directing professional attention to an improved method of performing ovariotomy, and to the selection of cases for the operation, and other modes of treatment?

The first meeting of the Association in London, 1862, its 30th anniversary, was rendered memorable by the surgical address of Paget. He spoke of the management of patients after surgical operations, and urged upon us all the study of the large group of diseases classed under the name of Pyæmia, their origin, multiform nature, and mode of prevention. Read the lecture again. It is a surgical classic, an eloquent but despairing cry from a great surgeon who feels the 'deep regrets, the bitter disappointments from which we might be saved if there were less risk' after many of the operations done to save life, and who shudders at the 'tolerated barbarisms of practice,' only justified by the belief that the risk of 'a cutting operation is so great that there is nothing too bad to be substituted for it,' and who can find but one thing that he can call remedial for the whole disease pyæmia, and that is, a profuse supply of fresh air—'wind blowing all about the rooms.' In his concluding remarks the orator impressed us all by his appeal to lessen the number of preventable deaths after great operations, insisting that the mortality 'will be reduced if the members of this Association will decide that it shall be, and will act vigorously on their decision.'

Deeply sympathising with this desire to remove all possible sources of excessive mortality after surgical operations, I brought the subject again before the Association at the Cambridge meeting in 1864. Feeling that something more than an abundant supply of fresh air was wanted, and knowing that with the air might enter unsuspected sources of danger to the patient through his wound, I directed attention to the researches of Pasteur upon the presence of infectious germs or organisms in the atmosphere, and to the demonstrations of Charcot and others of the impure particles in hospital wards, and showed how the development of low forms of animal and vegetable life was checked by the use of sulphur and the sulphites, as taught by Polli.

The Leamington meeting, in 1865, was distinguished by the address of Syme, in which he reviews the progress of surgery during the previous forty years, alluding among many other matters of interest to the *new position* which the operations of Thomas Keith, and my own, had given to an operation previously regarded as remarkable for uncertainty of prognosis, difficulty of diagnosis, and danger of execution. Coming from such a man at that time and on such an occasion, this judgment must have had considerable weight on professional opinion; and more than one writer has expressed his belief that by actually performing the operation on two patients in the following year, before the assembled Association at Chester, showing that it could be done and how it was done to a large number of practical surgeons, another step was gained in securing a more general admission of ovariotomy among the legitimate proceedings of surgery.

By this time the numbers of the members of the Association had greatly increased, the meetings were more numerously attended, and that at Dublin, in 1867, was reported as the largest known by several hundreds. There, as at Oxford in 1868, distinguished foreigners arrived among the visitors, surgical papers became more abundant, and the application of general science to surgery is more noticeable. Electricity, optics, acoustics, chemistry had all contributed to the perfection of instruments facilitating more exact diagnosis. The ophthalmoscope, the otoscope, the laryngoscope and the endoscope all appear as familiar aids for exploration. The thermometer was in almost

universal use, the sphygmograph still confined to the select few; the splanchnoscope or diaphanoscope then as now a curiosity. Microscopic parasites, animal and vegetable, were recognised in greater number, and were divided into orders, genera, and species. The infectious influence of hospital atmosphere was being more feared and more carefully guarded against, drainage was coming more into practice in the treatment of wounds, and as a preventive of local inflammation and general fever after surgical operations. At the Leeds meeting, in 1869, the antiseptic treatment was brought before the Association by Nunneley, who ridiculed it as a professional error, and said that he believed 'if stumps heal under such treatment they do so in spite of it.' Remember this was only eight years ago. Two years later at Plymouth, in 1871, the surgical address was given by Lister mainly on this one subject, and exclusively as the result of his own observation and experience, but with the effect of giving an immediate stimulus to the spread of the antiseptic system at home and abroad.

The meetings in 1872, at Birmingham, and in 1873, in London, with the attendance largely increased, the work methodically arranged in sections, the papers more varied, the discussions more animated, the presence of the Prime Minister at the dinner, the more complete amalgamation of the metropolitan and the provincial members, had both their share in assisting in the advancement of the social position of the profession and the progress of surgery. At Norwich in 1874, Mr. Cadge noted as recent improvements Esmarch's bloodless operations and the use of Dittel's elastic ligature. The germ theory of putrefaction and antiseptic surgery he looked at as subjects still waiting for solution.

At Edinburgh, in 1875, Lister's demonstrations and Spence's criticisms fairly brought all sides of the question under intelligent observation. Lister showed before large bodies of skilled and discriminating witnesses exactly what he did and how he did it, and with what results; while Spence, before the same assemblies, sharply criticised the work of his colleagues, and contended that as much could be done under similar conditions without antiseptic precautions. It is impossible to conceive a more satisfactory mode of completely discussing the principles of a new system of treatment than such a public trial before able

and impartial judges, with the advocacy of an earnest, enthusiastic, scientific investigator and worker on the one hand, and on the other with the opposition of a cool and sceptical rival minutely criticising the accuracy of every assertion and the logical value of each inference. And here in passing, let me beg you not to forget one chief, if not the chief, advantage of these meetings, most ably stated by Sir William Jenner yesterday. The most animated controversy may be carried on in the warmest manner, the most opposite opinions may be entertained and supported, the keenest rivalry for the honours awaiting him who first seizes upon a new truth may be exercised in the arena of discussion without the slightest personal animosity, but rather with an increase of the feeling of good-fellowship and mutual respect brought about at the social gatherings, where men are either thrown together for the first time or ripen old acquaintance.

It is impossible to review

THE SURGERY OF THE PRESENT DAY

without observing the result upon it of the work of Simpson, Syme, and Fergusson, whose deaths followed each other in such rapid succession.

The association of Simpson's name with chloroform and the lessening of hospital mortality, with the attempt to 'stamp out' infectious disease, with acupressure, with the uterine sound, and generally with the recently improved diagnosis and treatment of the diseases of women, need only be mentioned to be felt and acknowledged.

Syme's influence was rather that of a great teacher of clinical surgery, sending forth every year a large addition to the number of our profession, well grounded in the well-established principles of practice.

Fergusson, in the words of Paget, 'the greatest master of the art, the greatest practical surgeon of our time,' was the founder of the school which he, twenty-five years ago, first characterised by the happy term of Conservative Surgery—a term since become so familiar and so suggestive to the operating surgeon of care not to sacrifice limbs or parts which can possibly be saved, and never to risk life unnecessarily, that it

has gradually developed a race of modern surgeons who, not content with performing operations in the best possible manner, pride themselves far more on the number of lives and limbs that they have preserved. Fergusson said 'No one can more thoroughly appreciate a well-performed amputation than I do, but I certainly appreciate more highly the operation which sets aside the necessity for that mutilation.' Teaching all this as he did by example and precept for many years to large classes of young men, and to their seniors by his published writings and by lectures at the College of Surgeons, he has in a marked degree modified the character of the surgery of our age. The improvements which he introduced in lithotrity and in the cure of cleft-palate may be almost considered as typical of the school of modern conservative surgery, and will long be acknowledged as triumphs of British Surgery in the reign of Victoria. Of the man himself, so lately presiding at our meetings, so kind and friendly, the skilful surgeon, the beloved teacher, the wise and prudent counsellor, so lately lost to us, almost every one here still retains a vivid recollection; and his death is mourned as a loss to the Association which he adorned, and by a large number of our members as that of a dear friend.

And here, before quitting the progress of surgery in connection with the growth of the Association, let me ask if anyone can doubt that the art and the science of surgery have not advanced as much since the Elizabethan age as any other art or any other science, great as those advances may have been.

And in considering how that advance, as recent as it has been rapid, may be carried further on, let me first draw your attention for a moment to the subject of

ANÆSTHESIA AND ANÆSTHETICS.

In 1872, I made known my opinion that all the advantages of complete anæsthesia could be obtained by the use of bichloride of methyline or chloromethyl, and with fewer drawbacks, than by any other known anæsthetic. That was the result of an experience of five years, and of 350 serious operations. The experience of the five succeeding years up to the present time, with more than six hundred additional cases of ovariotomy, and

many other cases of surgical operations, has fully confirmed me in this belief. Given properly diluted with air, the vapour of chloromethyl has, in my experience of ten years with more than 1000 operations of a nature unusually severe as tests of an anæsthetic, proved to be without a single exception applicable to every patient, perfectly certain to produce complete anæsthesia, relieving the surgeon from all alarm or even anxiety; and its use has never been followed by any dangerous symptom which could be fairly attributed to it. I wish I could speak as confidently of the chemical composition of the fluid sold as bichloride of methyline as I can of its anæsthetic properties. But whatever may be its chemical composition, whether it is or is not chloroform mixed with some spirit or ether, or whether it really is bichloride of methyline, I am still content with the effects of the liquid sold under that name, when properly administered. The only deaths ever attributed to it were, I believe, rather due to asphyxia. No air was given with the methyline. By Junker's apparatus, air charged with methyline vapour is given—not the vapour itself—and, so employed, it has always been in my experience both efficient and safe. I am sorry that some of the analytical chemists whom I have asked to clear up the question of its composition have not done so. It ought to be done, it can be done, and it must be done.

I am very glad to be able to inform you that the Committee appointed in Edinburgh two years ago, reappointed last year in Sheffield, but which never met until this morning, is about to undertake this task. The Committee is made up of fourteen members from Aberdeen, from Edinburgh, from Dublin, as well as London, and it is almost impossible for so large a body to do what is required of them in the words of the resolution, namely, 'to inquire into and report upon the use in surgery of various anæsthetic agents and mixtures of such agents, and to collect and summarise the evidence of British practitioners in surgery and medicine as to the relative advantages of chloroform, ether, nitrous oxide gas, and other agents, and to carry on suitable experimental investigations.' We have therefore resolved to ask the permission of the Association to allow us to refer this duty to three gentlemen, all residing in Glasgow—Dr. Ramsay, an accomplished chemist, Dr. Joseph Coates, and

Dr. McKendrick, well known as having all the requisite practical experience in Physiology and Pathology, and with all requisite means of research in the very complete laboratories of the University of Glasgow—and I trust that the Scientific Grants Committee will devote a sufficient sum to encourage these really competent investigators to do the work thoroughly well, bearing the full responsibility and taking the credit which is due to work well done. The valuable reports on the life history of contagium, on the electric currents of the brain, and on the biliary secretion of the dog—which have already appeared in the Journal, and others of equal importance waiting for publication—are quite sufficient encouragement for us to extend the practice of entrusting original investigations to individuals who should be as liberally remunerated as the funds of the Association will permit, rather than trusting to the uncertain or impossible conjoint action of honorary committees. Perhaps we are hardly aware how much the public expects from us in this matter. Deaths from chloroform are alarmingly frequent, yet no substitute for it has found universal or even general acceptance in this country; and I am not speaking too strongly if I say it is the duty of the Association at once, without any unnecessary delay, to satisfy the public that all that is possible is being done to discover the means by which anæsthesia, effectual now, may be rendered safe for the future.

It is more than twenty years since I brought Wutzer's operation for the

RADICAL CURE OF REDUCIBLE HERNIA

to the notice of English surgeons. Wutzer's practice, afterwards modified by Rothmund, and the much more important change introduced and so successfully practised by Mr. Wood, of drawing firmly together the hernial apertures, so as to establish again the valve-like action of the inguinal canal, have hardly had the effect of generalising any of these procedures. For reducible hernia a truss, for strangulated hernia operation, are still the rule. I believe the time is coming when most cases of reducible hernia, at any rate those not completely secured by a truss, will be radically cured by the surgeons, if not of this generation,

certainly of the next. In many cases of inguinal hernia in young persons Wood's operation under antiseptics will become more general. But we have reason to hope that we may obliterate the hernial sac, close its abdominal orifice, and strengthen the abdominal wall by the use of insulated needles connected with the positive pole of the galvanic battery, causing shrinking and occlusion of the sac, while the alternate use externally of galvanisation and faradisation may assist in restoring tone to the weakened muscles. This is by no means the least of the many applications which may probably be made hereafter of

ELECTRICITY AS A THERAPEUTIC AGENT

in surgical treatment.

In 1848 I directed attention to the use of a weak continuous electric current in the treatment of ulcers. Dr. Golding Bird presented the results of my experience to the readers of his well-known work. Although the results were striking, Mr. Nunn is almost the only surgeon who seems to have made much use of the information. But recently a son of Dr. Golding Bird has published some very important additions to our knowledge of this subject, and has most advantageously treated scrofulous lymphatic glands by a painless electrolytic caustic. When chloride of zinc is employed as an arrow, or paste, or in any other way, the pain is very severe. But if formed electrically in the tissues of the living body, it acts in the nascent state as a caustic or destructive agent almost without pain. The albuminate of soda formed at the silver or electro-negative plate is probably inert, but the electric current certainly exerts some stimulating action, affects the capillary circulation, and so modifies reparative force as to quicken cicatrisation. In the electrolytic dispersion of tumours, caustic or destructive action at the positive pole and the influence of the negative pole upon the vaso-motor nerves of the part are both brought to bear. The more rapid action of the galvanic cautery upon nævus, or as a substitute for the knife, is already sufficiently appreciated; but the slower electrolytic action upon bronchocele, upon fibroid tumours, upon cancer in any of its forms, has yet to be worked out, and I hope that some of you

who are now present will not fail to take advantage of so fair an opportunity of doing good and distinguishing yourselves.

You start under immense advantages. When I began to practise surgery, the only test of normal or fever heat was the sensation conveyed to the surgeon's hand. It is hardly more than twenty years since the coincidence of a rigor and high temperature was first satisfactorily proved. Now the most delicate self-registering thermometers are not only carried by every careful surgeon, but every well-trained nurse is taught to make and record as many daily observations as the nature of the case may require. The various forms of surgical fever, pyæmia, septicæmia, erysipelas, are in consequence far better known and more perfectly guarded against, while the ground is cleared for the study of their more successful treatment.

So with the pulse; every one could count it, anyone could soon learn to distinguish a strong from a feeble pulse, a hard from a soft pulse, a pulse easily compressed from one that was incompressible, a regular from an intermitting beat, but to obtain a trustworthy and exact measure of arterial tension and the influence of treatment upon it, we must have the tracings of the sphygmograph. We are learning from its use after operations that the sthenic pulse with high arterial tension is an important guide for treatment, while the dicrotic pulse of low tension will warn us that septicæmia threatens, if it has not already attacked the patient. As an aid in detecting the effects of alcoholism, the earlier stages of the disease recently described as capillary fibrosis, and of kidney disease, the sphygmograph may prove of great service to the surgeon who is considering the fitness of a patient for operation. Dr. Mahomed's valuable observations on the exact localisation of an aneurism about the arch of the aorta, and the question of operation for its cure by distal ligature of one or more of the large vessels, are certain to lead to more accurate diagnosis and successful treatment.

In 1853 I introduced the ophthalmoscope of Coccius to the profession in England. One distinguished ophthalmologist still living ridiculed it in print as a toy; another, also happily among us, wrote that in cases of blindness it must be useless, and in all other cases where the retina was sensitive it was too dangerous ever to be employed. This was only twenty-four years ago, and

I ask you what would be thought of an ophthalmic surgeon now who attempted to practise without an ophthalmoscope? I need not weary you by more than the barest allusion to what has been done by the aid of the laryngoscope and the otoscope, or what may be expected from the endoscope or the diaphanoscope, when the instruments are perfected and their use has become general.

Till quite lately the tourniquet or compression of the main artery was relied upon as the chief means of checking the loss of blood in amputations and other operations. Esmarch's system of

BLOODLESS SURGERY

not only prevents the loss of blood much more completely, but as the parts operated upon are not bathed in blood, the surgeon can better recognise the nature and extent of disease, and perform many operations more easily with a smaller number of assistants; while the process appears to exercise a favourable influence upon the healing of the wound. The elastic constrictor will take an important place in the armamentarium of the surgery of the future, and no doubt many of the inconveniences ascribed to its use will be avoided when it comes to be more generally practised. So also with transfusion of blood. Dr. Roussell's apparatus for the transfusion of pure blood, and the subject generally, were specially discussed yesterday in the Obstetric Section. I need only therefore express my hope that everyone who practises surgery hereafter will make himself competent to transfuse safely, not only when a patient is bleeding to death after childbirth, or some accident, or operation, but in other cases where the blood is insufficient in quantity or deteriorated in its composition.

A certain section of the community, including many kind-hearted men and women whom we esteem very highly, but who have been led astray by thoughtless enthusiasts or self-interested itinerant lecturers, vehemently asserts that if we are to perfect ourselves in these or in other modes of saving human life, or lessening human suffering, we must only do so by practice upon the human subject; we must not, as a surgeon or a physiologist, take the life of a dog or a cat, a rabbit or a sheep, a pigeon or a frog, for any scientific purpose, or with the object of benefiting

the human race. Anybody may slaughter oxen and sheep by thousands for human food in any way he pleases, oysters may be eaten alive, the pheasant or the partridge, the fox or the deer may be expressly reared to supply the sportsman with exercise or the amusement of killing,—in a word, the lower animals may be devoted to the use of man for any purpose that is not scientific. But if a surgeon experimentally sacrifices half a dozen dogs or rabbits in the hope of improving some operation which may prevent the loss of human life or lessen human suffering, he is branded as inhuman, and barely escapes the supervision of the police. Possibly some of these benevolent individuals will voluntarily offer up themselves to our Committee on transfusion, in the hope of perfecting the practice. Until they do so, they will perhaps be a little less clamorous if a few sheep or rabbits are used in the cause of humanity. With regard to splenotomy, pancreotomy, and nephrotomy, accident has proved that the spleen, or the pancreas, or a kidney may be lost without great injury to the human being. Surgeons have removed a wounded pancreas and enlarged spleens, and a diseased kidney has been extirpated on two occasions at least, but the operative proceedings are still imperfect. Are surgeons to be allowed to excise the spleen or a kidney of a dog or a rat, or will zealous members of some Anti-Vivisection Society enroll themselves as candidates for that immortality which may be gained by any one who immolates himself upon the altar of science?

What is to be the future of nerve-stretching in neuralgia, or of skin-grafting as an aid in cicatrisation or the replacing of lost tissue, it will be for you to say when sufficient observations have been gathered together. And I pass on to speak of some undoubted triumphs of British surgery in our own time. The cure of vaginal fistula was scarcely ever attempted thirty years ago, and the operation was seldom successful when attempted long after that time. It now, even in very unpromising cases, almost certainly ends well in the hands of many operators in many countries.

It would be false modesty if I were not to say boldly before this Association that I am proud of the share which British surgeons have had, and of the share which I myself have had, in placing

OVARIOTOMY

upon the roll of successful surgical operations. Great leaders among us, Simpson and Syme, Stromeyer and Billroth, Velpeau and Nélaton, have shown a generous appreciation of our work. And can you imagine a greater pleasure to a surgeon than to hear the President of the Medical and Chirurgical Society speak last year of his improvements in the operation of ovariotomy as 'one of the greatest achievements of surgery in this century, and that the influence for good extended through every department of operative surgery'? (*Note* 5.) while at the same Society in 1850, Lawrence had asked whether this operation 'can be encouraged and continued without danger to the character of the profession.' (*Note* 6.)

Less than a quarter of a century after this denunciation, Lord Selborne, one of the most distinguished of our Chancellors, publicly stated the result of a calculation, that by my first 500 operations I had added 10,000 years to the lives of European women. (*Note* 7.)

What number of operations has been done by other surgeons I know not, but supposing that the same probability of the duration of life applies to the women who have recovered from operations I have done since the results of my first 500 cases were published in 1872, the gain would be about 18,000 years. And this is the work of one surgeon alone, and by one operation which only thirty years ago was denounced as so 'fearful in its nature, often so immediately fatal in its results,' that, whenever performed, 'a fundamental principle of medical morality is outraged.' (*Note* 8.)

I should not venture to say all this if it were not by way of encouragement to every one who hears me to do the work which comes before him, whatever it may be. Nothing could be more unlikely than that I, up till 1855 a naval surgeon, serving in 1855 and 1856 with the army in the Crimea, never having till that time treated a single case of ovarian disease, removing an ovarian tumour for the first time in 1858, and waiting three years before I had done ten cases, should now be able to say that I have completed the operation on 868 women.

And what is still more gratifying, that I should be able

among the performances of the many surgeons who have been running the race with me, striving with generous rivalry to obtain the reward of those who do good in their day and generation, to refer to the brilliant results obtained by my dear friend Thomas Keith—who, out of 241 operations, has saved 206 lives—a success hitherto unequalled in the history of any capital operation. How ovariotomy, since it has become so generally accepted here, has spread in America, in France, and Germany, indeed all over the world, I have tried to tell elsewhere, and I will not weary you by telling the story again, but I cannot pass from this part of my subject without expressing my confident assurance that what the surgery of the present age has done for the treatment of ovarian tumours the surgery of the future will do for that of uterine tumours. Already large fibroid and fibrocystic tumours of the uterus have been removed in America by Atlee, Kimball, and others, in this country by Clay, Keith, Bryant, Thornton, Routh, and myself, in France by Kœberlé and Péan, quite in sufficient number, and with results sufficiently satisfactory to prove that we only require a better knowledge of the details of the operative procedure, and greater experience in meeting the various difficulties which may arise, to place the removal of uterine tumours by gastrotomy amongst the most hopeful of the many lines of thought and action open to the operating surgeon of the future.

But I think those who study and are to become the

CONSERVATIVE SURGEONS OF THE FUTURE

must not be content with saving limbs only. It is life that must be saved. And the great lesson taught by the success of ovariotomy and of operations for the removal of uterine tumours is, that they must not be done except under the most favourable possible conditions, whether in private houses or in hospitals. We are only just beginning to reap the benefit of the results of the labours of the Health of Towns' Commission, and of the work done by medical officers of health all over the country; and a great deal more must be effected before we can ensure even to the most wealthy of our patients a plentiful

supply of pure water, a room well warmed, well aired, and free from the presence of sewer gases, and security from the entrance of infectious disease.

In hospitals the problem is still more difficult; whether the hospital be large or small, old or new. But we do know that overcrowding of any building is of more importance than its size. A large crowded hospital must be a more dangerous place for operations than a small one equally crowded, but a large hospital, where each patient has plenty of space and fresh air, would certainly be a safer place for an operation than a crowded hospital, even though much smaller. In the hospitals of the future, whatever their size may be, the patients must not be allowed to poison each other. And for my own part I would rather operate in a clean, quiet, well-warmed, and well-ventilated building, be it large or small, without any antiseptic precautions, than run the risk of trusting to the neutralising or destructive power of chlorine or iodine, sulphur or tar, borax or the permanganates, salicylic or any other acid, in a place tainted by the presence of sewer gas, or the seeds of some infectious or contagious disease.

I should have said more on this important subject of antiseptic surgery if the bearing of the germ theory on infectious disease had not been so ably and exhaustively treated by Dr. Roberts in the address on medicine yesterday, and if in the Surgical Section a special discussion had not been arranged. But as both these things have been planned as distinct parts of the meeting, I leave what would otherwise have occupied nearly the whole of this address, to ask you for a moment to consider what must be the

EDUCATION

of the men who are to advance the science and practise the art of surgery in the future; how some of the best of the men of the coming generation are to be induced to adopt this career.

I need not speak to such an assembly as this in Manchester, where all the essentials of a chartered University already exist, of the importance, or rather of the absolute necessity, that the surgeons of the future must be educated gentlemen; that we should so order our schemes of education,

whether conjoint or not, as to bring into the profession, as far as possible, young men who have had the advantage of the highest general culture to be obtained by an English education. Until this is secured the flower of our University youth will still choose the church or the bar, the army or the navy, or some branch of the civil service of the state, where they at once take an enviable social position as members of an honourable profession, and where a successful career may lead to a seat in the House of Lords, to the pensions and titles freely granted to the fortunate soldier or sailor, and, more sparingly, to the meritorious civil servant of the Crown.

It is rather surprising that without any of these inducements, and in spite of the taint of trade forced upon the profession by the powers of the Apothecaries' Company, and its continued alliance with our Colleges and Universities, we still have abundant evidence of a rapid rise of the profession in the social scale. Apart from examples at home familiar to us all, the marriage of the German surgeon, Esmarch, to a princess of his own country is even a less striking indication of a change for the better in the social standing of our profession abroad than the fact, much less generally known, that a royal prince by birth, Prince Charles Theodore of Bavaria, is a doctor of medicine, is known to be a clever operating ophthalmic surgeon, and has written a very able article, published in a late number of Virchow's *Archives*, on leucocytes in the substance of the brain in various diseases.

When German princes practise surgery, and a brother of an English earl, a Cabinet minister, is met with as a practising physician, we may think less of the admission of members of our profession into royal and noble families, and look with more hope for recognition by the Government of services rendered by medicine and surgery to the nation. We shall not then have to notice anything so disheartening to a learned profession as the fact, that while for the affair of Magdala Lord Napier was honoured by a title and rewarded with a pension, the extended average duration of life of the whole population and its actual increase, due to sanitary and medical science—far exceeding in importance the annexation of a province, or even of a kingdom—has earned for Simon the barren right, shared by many less honourably known men, of putting the magic letters

C.B. after his name, and William Farr still remains without any mark of national gratitude.

Why should a baronetcy be the highest titular distinction conferred upon members of our profession? Is Jenner or Paget less worthy of a life-peerage than any one of the eminent men who now sit on the bench of bishops, or any of the lawyers, soldiers, or sailors who have been rewarded by hereditary peerage? Can any member of the House of Lords do greater service to his country in that assembly than would such a wise and learned physician as Watson, who so very lately has proved himself capable of the highest efforts of statesmanship by his remarkable essay on the abolition of zymotic disease?

Since the health of the people is, or should be, one of the first objects of legislation and administration, the help of acknowledged masters of sanitary science is indispensable. That want now manifest in the recent ill-devised Acts of Parliament, and the imperfect machinery put in action for their execution, must force upon the nation the conviction that medical science ought to be properly represented in Parliament, and especially in the House of Lords. None of our leaders have time for electioneering or the turmoil of party struggles in the House of Commons; whereas many of them are well fitted for the more dignified position, and would be quite able to devote their time and energy, to sanitary legislation in the senate.

And what a task lies before the medical statesman! Never in the whole history of our profession have we had so much work to do, such problems to solve, so many human beings dependent for their health on our knowledge and our care. The Roman empire in its greatest power sinks into insignificance in comparison with the dominions now under the sway of Queen Victoria, Empress of India. Two hundred millions of human beings in India, other millions in Africa, Australia, New Zealand, the islands of the Pacific, in Canada, and the West Indies are affected for good or for evil by the action of the sanitary advisers of our Government. At home, until we can disband the great army of paupers, we must at least save them from preventable disease, and the multitudes of our neglected children must be taught some elementary facts necessary for the preservation of their health and the prolongation of life. The

day cannot be far distant when this will be done by Parliament under medical guidance.

But until that day comes, it is for this great Association, for every member of it, to strive to secure for our countrymen and our dependents protection from the effects of incomplete and neglectful legislation. And there is ample encouragement to set to work at once, earnestly and with set purpose, acting in the spirit of the noble motto of the French Society of Surgery :—

Vérité dans la Science,
Moralité dans l'Art.

If, in the forty years since this Association was founded, the great progress which I have so hastily and imperfectly endeavoured to review has been made, what may we not augur for it in years to come? The Association had its early struggles, and has passed through them. It is now powerful and vigorous; its organisation is almost complete, its resources are yearly increasing, and its influence, through its annual meetings, its branch operations, and the wide circulation of its invaluable Journal, is universally felt. The history of the past and the study of the present, alike help us to look forward with hope and trust to the future.

'LOOK NOT MOURNFULLY INTO THE PAST. IT COMES NOT BACK AGAIN. WISELY IMPROVE THE PRESENT. IT IS THINE. GO FORTH TO MEET THE SHADOWY FUTURE WITHOUT FEAR, AND WITH A MANLY HEART.'

NOTES.

Queen Mary.

Note 1 *to page* 6.—A careful examination of all that has been recorded in reference to the life-long bad health, many illnesses, and fatal malady of Queen Mary leads to the conclusion that she really died of some ovarian disease. Her mother was subject to many infirmities, and died in middle age. Mary inherited from her a feeble constitution, though as a child and up to the time of puberty there was no important illness. She was slim, small of stature, very near sighted, not bad looking, quick, and very excitable. The conditions of her life were not favourable to development. Capriciously and sometimes harshly treated by her father, all her affections were thrown back upon her mother, from whom, after the divorce, she was separated. She thus lived a life of seclusion; and her education was so unnaturally forced that in her teens she was known to be mistress of five languages, in four of which she was able to converse. As a proof of her ability, there exists an unfinished translation of the paraphrase of Erasmus on St. John's Gospel into English. This was interrupted by illness, in the form of difficult and deficient menstruation, to which she remained subject all the rest of her life, and which she almost always alluded to under the term of 'her guests.'

At the age of twenty she lost her mother. Sorrow, mental anxiety caused by her father's expressed antipathy and wishes for her death, the ceaseless annoyances, afterwards so repented of, by Anne Boleyn, and her isolation from all the pleasures of family life, tended to depress her. She had scarcely known what it was to be a child, she was not strong enough to be a woman, and at this time she was almost in the condition of a confirmed invalid. The privy expenses show how constant was the attendance of her physicians; and, what is worse, that they knew nothing better to do than incessant bleedings. There was evidently pelvic engorgement. In her young days she was florid, with a circulation easily disturbed. From the daily presents of fruit sent to her by the neighbours, one might suppose she had a craving for that sort of food. She suffered intensely. She was bled from the arm; blood was taken from one foot, then from the other, and 'otherwise.' She was ordered to walk and to use horse exercise, and was continually taking apothecary's 'stuff.' At another time she was fainting, unable to sit up, and could only go about in a litter. But

withal, while irritable, she was gentle and affectionate; and even Michele, the Venetian ambassador, could write 'senza adulatione delle bellezze dell' animo.'

Notwithstanding this, like many girls in the same state, she seems to have had the maternal instinct very strong. Not that a breath of suspicion ever passed over her, but it showed itself in her fondness for children and her avidity for the office of god-mother. This she accorded profusely to poor as well as rich. Her life from this time almost up to the accession of her brother, when she was thirty-two, is little more than a diary of sickness and a record of doctoring depletions. The restoration of her legitimate position not long before her father's death, the festivities of the young court and the restored society of her sister, had then the good effect of improving her health, and for a time she had a respite from suffering. But political reasons again drove her into solitude, and with solitude again came sickness. In the spring of 1550, when she was about thirty-five years old, she was living at New Hall in Essex, and her health was so infirm that her death was generally expected.

In spite of her feeble constitution and her aggravated prostration, she was a woman of great energy; and she made herself equal to the exertion demanded of her during the early part of her own reign. Then came her marriage. She looked to it with hope, and it brought her disappointment and misery. Philip was not only cold and neglectful, but treated her shamelessly. She became pregnant, and the pregnancy ended in disease. She was delivered of something. One called it a lump of flesh, another a mola. Whatever it was, there is no reason to suppose either self-deception or a design of imposture. Her family, as well as herself and her medical attendants, men of character and repute, all expected the birth of a child. Her husband then sought every possible pretext for his absence. Mary, when she appeared in public, was pale as a corpse, and looking ten years older than when she was last seen. Philip returned to England for a short time in 1557. Mary was really ill, and lived a life of utter privacy. She was enlarged, and the hope of an heir returned. She wrote to her husband, informing him of her supposed condition. He simply replied that it was the best news he had to console him for the loss of Calais. She made a will, providing for the contingency of a prince; but this time there was really delusion. The swelling was disease. She was staying at Richmond, and was said to have caught a bad intermittent fever. She changed to Hampton Court, another malarious place. No better, she removed to St. James's, almost as bad as Hampton. There for some few weeks she 'languished;' and on the morning of the 17th November, 1558, while receiving the last

sacrament, died in full possession of her senses. This is not the history of death from ordinary dropsy, nor the usual end of fever, to which it was imputed. All points considered, it looks much more like exhaustion or pyæmia from an ovarian tumour, with one or more of its compartments inflamed or suppurating. Another fact supporting this view is that there was no tapping. The tumour was in all probability too solid for the surgeons with their ideas of dropsy to attempt it. The body was embalmed, but there is no account of any medical examination; and the officials to whom that duty was assigned unfortunately were not pathologists.

Surgeons and Physicians.

Note 2 *to page* 6.—Caius.—'He was so eminent a defender of the College rights and privileges that, there happening in the reign of Queen Elizabeth to arise a difference between the physicians and surgeons, whether the surgeons might give inward remedies in the sciatica, French pox, or any kind of ulcer or wound, &c., Dr. Caius was summoned (as President of the College) to appear before the Lord Mayor, and others of the Queen's delegates, before whom he so learnedly defended the College rights and the illegality of the surgeons' practice in the fore-mentioned cases, against the Bishop of London, Master of the Rolls, &c. (who brought many arguments in behalf of the surgeons), that it was unanimously agreed by the Queen's Commissioners that it was unlawful for them to practise in the fore-mentioned cases.'—Extract from Munk's *Roll of the College of Physicians*, vol. i. p. 35.

Note 3 *to page* 6.—Malgaigne on Hunter.—'La chirurgie, telle que l'avait laissée le moyen-âge, ne s'élevait guère au-dessus d'un métier; A. Paré et J. L. Petit en avait fait un art; J. Hunter la constitua à l'état de science."—Malgaigne, *Essai sur l'histoire et la philosophie de la Chirurgie.* Paris, 1847, p. 32.

Note 4 *to page* 7.—Costello and Lithotrity.—During the meeting of the Association at Oxford, July 23, 1835, 'Mr. Costello performed the operation of lithotrity before a large assembly of the members. The Anatomical Theatre, having been found incapable of holding all the members of the Association who were anxious to see the operation, application was made to the Mayor, who kindly gave the use of the Town Hall for the purpose. Mr. Costello began by observing that as the patient was waiting, he should first perform the operation, and deliver some general remarks upon it after the patient had retired. The stone being discovered by the catheter, Mr. Costello gently introduced his instrument, and presently the stone was seized. Being of an unyielding nature, the instrument was fixed in a vice, and the hammer was used to comminute

the stone; the fragments were subsequently seized, and broken by the sole pressure of the operator's hand, or by the hammer. The patient seemed to suffer nothing, and expressed himself grateful for the relief he experienced, put on his clothes, and retired.'—*Transactions of the Association*, 1835.

Note 5 *to page* 22.—Sir James Paget on Ovariotomy.—The following is a report of the remarks made at the meeting of the Royal Medical and Chirurgical Society, February 27, 1877, as published in the *Medical Journals*, and afterwards corrected by Sir James himself:—'Sir James Paget said that it was with great pleasure that on the last occasion of his holding the chair at an ordinary meeting of the Society he had listened to so important a communication, and he deemed the operation of ovariotomy, as perfected by Mr. Spencer Wells, to be one of the greatest achievements of surgery in this century. Contrasting the results of the operation as performed at present with those which he remembered in his early professional career, he could testify to the very greatly increased success obtained by all surgeons now. The gain was not limited to ovariotomy alone; the success of that operation had led to an extension of the whole domain of peritoneal surgery. Surgeons acted more boldly than before in operations involving the peritoneum; and the influence for good was not limited by the increased success of ovariotomy, but extended through every department of operative surgery, and will always continue to be felt in the whole practice of surgery.'

Note 6 *to page* 22.—Lawrence on Ovariotomy.—At a meeting of the Royal Medical and Chirurgical Society, Nov. 12, 1850, Dr. Addison, president, Mr. Duffin's successful case of ovariotomy was read, and a paper by Dr. R. Lee, entitled 'An Analysis of 108 Cases of Ovariotomy which have occurred in Great Britain.' In concluding the discussion, Mr. Lawrence said:—'I have no experience of ovariotomy. I have not performed it, and, unless my view of the matter should be essentially altered, I never shall. . . . The discussion this evening, excited by the important communication of Dr. Lee, will at least serve the useful purpose of admonishing us to pause in the attempt at treating diseased ovaries by surgical operation; and, after seriously considering the matters brought to light by that communication, the forty or fifty cases from another quarter, and the proposed oviduct scheme, to ask ourselves the question whether such proceedings can be managed and continued without danger to the character of the profession.'—*Lancet*, vol. ii. 1850, p. 586.

Note 7 to page 22.—Lord Selborne on Ovariotomy.—Lord Selborne, speaking at the opening of the Dorset House Branch of the Samaritan Hospital, in 1875, said:—'The work done by the hospital he regarded not only with satisfaction, but with admiration, for it represented one of the most splendid triumphs of modern surgical art and modern philanthropy, one of the greatest achievements of medicine or of surgery in any age. Until a few years since this kind of disorder had been regarded as necessarily and absolutely fatal, and as reducing the reasonable possibility of life in the woman afflicted by it to four years, though the duration of life generally fell far short of that. In a medical publication, reviewing in 1873 the work of that eminent man—Mr. Spencer Wells—whom this institution has the advantage of calling its surgeon, it was calculated that in his practice alone he had been the means of adding twenty-five years to the probability of life of each of the 373 women on whom he had successfully operated. Instead of the four years of declining health and hopeless misery which those women would have had to anticipate, not only those four years, but twenty-five years which, upon the average, had been wholly saved to them, were years of restored health, usefulness, and happiness to those who had been benefited by the operation. He thought the man of whom that could be said, and the art of which it could be said, deserved higher honours, higher reward, and higher praise than most things which it was permitted to any man or any art in this world to be able to do. If ever there was a public benefactor, surely it was the man who, by a long course of practice, had brought to such perfection so invaluable an art. He had rescued from the grave, not only great numbers of his own fellow countrywomen, but of the women of other countries, for his example, his courage, and his skill had taught others to do likewise, and the successful practice of the operation was spreading all over the world. The man of whom he had spoken, and whose name was inseparably identified with the Samaritan Free Hospital, was as well deserving of the highest public honour as any man living.'

The 'medical publication' alluded to by Lord Selborne was the *British and Foreign Medical Review*, April 1873. The passage may be found at page 296—as follows:—'Peaslee asserts that "it may be shown that in the United States and Great Britain alone ovariotomy has within the last twenty years directly contributed more than thirty thousand years of active life to woman; all of which would have been lost had ovariotomy never been performed." The calculations by which he arrives at these results are elaborate, but no less just, and applying them to the 500 cases of Mr. Wells, we find that nearly one-third of this accrued life arises out of his 373 successful operations. The average age of all his patients was as nearly as possible thirty-eight years, at which period the Carlisle

Tables assign an expectancy of life for a healthy woman in this country of twenty-nine years. Without the operation it is a liberal allowance, and much below the estimate of Boinet, to say that 95 per cent. of these women would have died in less than four years, while the remaining 5 per cent. might, perchance, have averaged eight years each of life. The whole 500 would thus only have realised, if left to themselves, 2,100 years out of the 14,000 naturally due to them.

'But calculated on the basis just stated, the years added to the lives of the 373 recoveries, minus the loss of life from the 127 unsuccessful cases, yield a total gain for the 500 patients of 10,817 years. The 373 survivors, however, have secured by the operation the probability of the gross amount of 10,817 years of average healthy life, instead of the 1,492 years of miserable endurance which they might have passed before death without operation.'

Of the 368 patients operated on since the 500 on which the above calculation was made, 282 recovered—making the total recoveries 655. Multiplying this number by 29 years, the average estimated gain of each patient, the total gain amounts to 19,095 years. Lord Selborne appears to have calculated 25 years as clear or absolute gain; and 4 years of health in place of the 4 years of suffering and disability.

Note 8 *page* 22.—Morality of Ovariotomy.—In a review of Clay's work in the *British and Foreign Medical Review*, of 1843 (vol. xvi., p. 402), this passage is found:—'To our thinking the facts need no comment. We earnestly hope that they will prevent the younger members of the profession from being dazzled by the *alleged* success of an operation, which, though it may excite the astonishment of the vulgar, calls neither for the knowledge of the anatomist nor the skill of the surgeon. In some Continental Universities the candidate for the doctor's degree takes an oath, "Nullius unquam hominis vitam ancipiti tentaturum experimento;" a fundamental principle of medical morality which we conceive is outraged whenever an operation so fearful in its nature, often so immediately fatal in its results, as gastrotomy, is performed for the removal of a disease, of the very existence of which the surgeon is not always sure; of the curability of which, by his interference, he must be in the highest degree uncertain.'

*** I at first intended to print some extracts from the following address, delivered in 1864, as notes to page 11, on the Beginning of Antiseptic Surgery in England, but by the advice of my friend, Mr. Lund, who was President of the Surgical Section at the Manchester meeting, and whose contributions to the progress of Antiseptic Surgery are so well-known and highly valued, I have reprinted the whole Address from the 'Medical Times and Gazette' of October 1, 1864.

ON

SOME CAUSES OF EXCESSIVE MORTALITY

AFTER

SURGICAL OPERATIONS.

Read before the British Medical Association at Cambridge, August 1864.

Mr. President and Gentlemen—

When concluding one of the most eloquent, thoughtful, and suggestive addresses in Surgery ever delivered before this Association—after the statement that in Paris 'the mortality of great operations has been diminished 10 per cent. in the last twenty years, yet that the mortality of all amputations in the Parisian Hospitals is still about 50 per cent.,' while at Oxford, Exeter, and Cambridge three distinguished members of our Association have shown that instead of 50 it is only 13, 14, and 16 per cent.—Mr. Paget said, 'Some of the deaths are preventable,' and added that the mortality of great operations must be and '*will be* reduced, if the members of this Association will decide that it *shall be*.'

It would be very easy to add many facts to those just cited to prove that some of the mortality after Surgical operations might be avoided or prevented—in other words, that the mortality is excessive—especially in the large Hospitals of large cities. A mortality of 39 per cent. after amputations in the Paris Hospitals from 1836 to 1841, including amputations of the fingers and toes (the thigh 62, leg 55, arm 45, forearm 28), was, when announced by M. Malgaigne, regarded as a startling revelation. Yet M. Frelat, carrying on the researches to 1861,

shows that the mortality was by no means over-rated, for 1144 amputations in those later years gave 522 deaths, or 45 per cent. In the Glasgow Infirmary, reports of different periods give 36 and 53 per cent. In the Edinburgh Infirmary, 50 per cent. In the large London Hospitals, 25 to 35 per cent.; and yet in smaller Provincial Hospitals it is 13, 14, and 16 per cent.

If we descend a little into detail, we find the same difference of result carried out. Separating primary from secondary amputations, we find the mortality in Paris 50, in London 22, in Massachusetts 12 per cent. Taking secondary amputation of the thigh alone, we have Paris 60, London 21, Massachusetts 19. Take lithotomy, and we have Paris 37, London 22, and of 222 cases in English Provincial Hospitals, 12 per cent. Herniotomy shows a mortality in Paris of 60, London 50, and Wurzburg 43 per cent. Results so different from the same operation surely prove that in some places the mortality must be excessive, and encourage us to hope that by discovering the causes of excess we may reduce it.

All these facts having been collected in Hospitals, the first and most material inquiry relates to the mortality in Hospitals of different sizes. McCulloch, in his 'Statistics of the British Empire,' has shown that for every 100 cases treated in County Hospitals about 4 died, while in the London Hospitals about 9 died in every 100. One most eminent medical statistical authority has recently stated that 'the mortality of the sick who are treated in large General Hospitals in large towns is twice as great as the mortality of the sick who are treated in small Hospitals in small towns. It remains to be seen whether the mortality in small Hospitals is not twice as great as the mortality of the same diseases when they are treated in clean cottages.'

Whether the large array of facts upon which Dr. Farr's conclusions are based may be acknowledged to bear them out fully, partially, or not at all—whatever allowance may be made for the greater severity of cases attracted to large Metropolitan Hospitals by the celebrity of some of the Physicians and Surgeons to those institutions—however great must be the allowance made for the number of slight cases admitted in some of the smaller country Hospitals, especially in the Medical division, we have good reason to believe that the mortality after

certain operations which are performed everywhere much in the same way—such as secondary amputation and lithotomy,—is much greater in large city than in small country Hospitals, and that the mortality of the same operation in Hospitals of the same city varies very much with the situation, size, and crowding of the Hospital.

The first conclusion, therefore, is that Hospitals, without being so far removed from the centres of population as to be accessible with difficulty, should be surrounded by open spaces, and should not be too small for the number of patients. And whatever may be the size of the building, the fewer the number of floors or stories in it, the less is the probability of excessive mortality.

In the very interesting account of this town, with its University and Colleges, for which we are all so much indebted to Dr. Humphry, I find the following passage :—

'Addenbrooke's Hospital, founded in 1719, by the will of Dr. John Addenbrooke, of St. Catherine's Hall, was insufficient for its purpose, and ill-constructed. It has lately, therefore, been pulled down, and is in process of re-erection. It will be an extensive, commodious building, with spacious wards having windows on both sides, convalescent rooms, etc. The accommodation for out-patients, other offices, and one ward, will be on the ground floor ; wards for Medical patients will be on the first floor ; *and above will be the Surgical wards* and operating-room.'

Supposing this plan to be carried out (which, for the credit of the future Surgery of Cambridge, I sincerely hope it will not be), I think we might predict very confidently that the low mortality hitherto so honourable to the institution and its Surgeons, will rise much nearer to the high rate of our city Hospitals. In a recent discussion in the French Academy, M. Malgaigne showed that the mortality from erysipelas and allied affections associated with overcrowding is increased when Surgical wards are placed over other wards ; and Velpeau supported the statement when he admitted that erysipelas was more frequent in the Charité among the females than among the males, the female wards being on the second floor, immediately over those occupied by the men. Women after delivery are so nearly in the same condition as patients after operation, that we may

learn a great deal from the mortality in Lying-in Hospitals, or in the Maternity Department of large Hospitals, and we find the same increase of mortality in the upper wards. Several years ago the lying-in wards of St. Louis were on the ground-floor, hemmed in on every side, and almost dark; still the mortality was lower than in other Hospitals, puerperal peritonitis being especially rare. At the time of the construction of the Pavillon St. François, the lying-in wards were removed to the first-floor, which was isolated and very light. The latest sanitary improvements were adopted, yet the mortality, instead of diminishing, rose rapidly to equal that of other Lying-in Hospitals.

But lessening the number of large Hospitals, and increasing the number of small Hospitals, and having the wards all on one story, would all be useless if there are too many beds in a ward. It is very possible that a large Hospital, with large wards and beds widely apart, would be a far better place for the sick than a small Hospital, in which many beds are crowded into small wards. Indeed, by lessening the size of a ward we multiply the surfaces and angles to which putrescent matters or organic poisons may adhere. And it is extremely probable that we may have to go further than this, and not only lessen the size of Hospitals, the number of floors in the building, the number of wards, and the number of beds in each ward, but also *isolate* the patients in all cases when contagion or infection is probable. Not only must communication of wards with each other be avoided, but there must be separate wards, containing one, or at most two beds, for patients recently operated on, and in Lying-in Hospitals for women recently confined, before we can hope to reduce mortality from the excessive to the unavoidable rate.

Now, to show that these lessons of modern sanitary science are borne out by the most recent discoveries in Physiological Chemistry, let me turn for a moment to the remarkable labours of Pasteur,—all made known within the last five years—his memoir on 'Alcoholic Fermentation,' in 1860; 'On the Organised Corpuscles existing in the Air,' and his 'Examination of the Doctrine of Spontaneous Generation,' in 1862. His 'Studies on the Mycoderms,' and the 'Manufacture of Vinegar,' published the same year; his 'Examination of the part attributed to Oxygen in the Destruction of Animal and Vegetable Matters

after Death,' and his 'Researches on Putrefaction,' in 1863, have all a very important bearing upon the development of purulent infection and the whole class of diseases most fatal in Hospitals and other overcrowded places.

Commencing by purely chemical researches into the phenomena which accompany the decomposition of organic bodies, M. Pasteur was soon led into the field of Physiology. He found that fermentation was always associated with the existence and development of certain microscopic beings; and he was led to inquire whether the generation of these living corpuscles was a spontaneous act or change, or whether it could only be explained by the ordinary laws of reproduction. In order to ascertain what germs might be suspended or floating in the atmosphere, he adopted the simple expedient of causing a current of air to pass over gun-cotton—a substance soluble in a mixture of ether and alcohol. The fine fibres of the gun-cotton act as a sort of air filter, arresting all the solid particles, and the finest powders are found in the solution, and fall slowly to the bottom of the fluid. By careful microscopic examination he found in these atmospheric impurities (1) a quantity of granules of starch, very easily recognisable, and the numbers explained by the abundance of cultivated cereals; and (2) corpuscles which resemble in every particular the germs of the lowest organisms, and vary greatly in size and structure. The germs so collected are fecund. If they are sown in infusions in which any pre-existing germs have been destroyed by ebullition, and which have only been exposed to air which cannot possibly contain any living organism, as it has been passed through a tube of red-hot platinum, an abundance of cryptogamic vegetables and infusorial animalcules very soon appears. These vegetables are the *Mucors* or *Mycodermes*, which cover the liquid with a greasy or gelatinous pellicle; the *Mucedinea*, formed of small tubes; *Torulacea*, or non-tubular plants, which attach themselves to the bottom of the vessels. The infusoria are small *Monads*, *Bacteria*, and *Vibrios*. The Bacteria, especially the *Bacterium Termo*, exist in the air in immense abundance. This smallest of the infusoria is found also in all putrefying substances. It multiplies in the intestinal canal of man, and is found constantly in the white matter which collects daily between the teeth. In sour milk it is found in company with Vibrios, the most viva-

cious of the infusoria, whose germs are not destroyed by a temperature of 100° Centigrade. The spores of the *Mucedinea* remain fecund even up to 120° Centigrade. It appears that a short exposure to 130° Centigrade destroys all fecundity even in the most robust; but in nature neither spores, vegetable, nor animal germs are ever exposed to a degree of heat which can render them sterile.

When an organic infusion has been deprived of germs by heat and is mechanically protected from the corpuscles which the air might carry to it, it is as unalterable as an ordinary chemical solution of a mineral. The liquids ordinarily the most prone to fermentation now show no tendency to decomposition —no symptom of life is manifested. It is quite clear, therefore, that the development of living beings in organic infusions is not spontaneous, and that, in the circumstances under which fermentation ordinarily takes place, the germs of the living beings are carried in the atmosphere.

The germination of inferior beings as powerful agents of decomposition has relations as important in the putrefactive as in the fermentative process. Whenever organic matter undergoes change—dies, is decomposed, putrefies—germs are sown which find their nourishment in the remains given up to destruction. Without these germs the immediate principles of living bodies would be almost indestructible; with them, everything which has ceased to live is returned to the atmosphere and to the mineral kingdom. Blood as it issued from the arteries, fresh urine, milk received into close vessels, and open only to air which had been deprived of germs, remained unaltered for three years; but when these liquids were exposed to ordinary atmospheric air, they very soon became covered with mucedinea, bacteria, and monads, and were filled with moving vibrios.

Each form of fermentation or decomposition is associated with the growth and development of some low form of vegetable or animal life. It had long been known that the yeast formed in brewing beer was an organised substance, living, and formed by a mass of cells capable of reproduction by budding; but it was left for M. Pasteur to show that the cells of the yeast really nourish themselves at the expense of the sugary infusion, and transform it, not by a physical or chemical,

but by a physiological action; that some substances added to the infusion favour the budding and multiplication of the yeast, others retard, others altogether arrest it—like the albumen of fresh eggs, which kills it, or acts on it as a poison. When alcohol is transformed into acetic acid a vegetable mycoderm (*Mycoderma aceti*) is the agent of the transformation. When sugar or lactic acid is converted into butyric acid, the agent is not a vegetable, but a small animalcule, seen in the form of small cylinders or rods, isolated or united into chains of many links, which turn, undulate, and float in every direction in the liquids, and are reproduced by fission. The most remarkable property of these vibrios is that they have the power of living and indefinitely multiplying themselves without oxygen. Not only can they live without air, but air kills them. This peculiarity essentially distinguishes the mycoderms from the vibrios. The mycoderms incessantly feed on oxygen, and when they do not find it in solutions take it from the atmosphere. The vibrios are killed by oxygen, yet it is by them that the butyric and tartaric fermentations are effected.

These are the most simple of the decompositions produced by animalcules which live without free oxygen. They are phenomena which do not differ from what is called *putrefaction* of animal substances. In putrefaction, as in the butyric fermentation, the work of the vibrios is prepared for them by infusoria. In infusions of animal substances no change is observed for about twenty-four hours; then a slight movement may be observed, which is caused by small animalcules *Monas corpusculum*, *Bacterium Termo*—moving in all directions in search of the oxygen in the infusion. If access of air is shut off, the infusoria die as soon as they have consumed all the free oxygen, and fall dead to the bottom of the vessel. But if the infusion is open to the air, they find an inexhaustible supply of oxygen at the surface, when they soon form a pellicle of gradually increasing thickness. But as soon as this living pellicle has been formed the germs of vibrios are in their turn fecundated, and these animalcules rapidly multiply in a liquid which contains no oxygen. At the bottom, the vibrios change the organic matters into substances of more simple composition; while at the surface the bacteria and mucedinea burn these new products with the oxygen which they take from the atmosphere, and

reduce them to the state of the most simple binary compounds, water, ammonia, carbonic acid. In the same way after the death of an animal or human body, the vibrios and their germs which have remained in the intestinal canal quite inoffensive so long as the movements and functions of life have prevented their development, commence their office directly after the death of the body which they have inhabited. Shut off from oxygen, surrounded by nourishing food, they pass from within outwards, destroying the substances which surround them. At the same time the germs of infusoria which the air has deposited upon the external surface of the body are developed, and work from the surface inwards. At length the infusoria and vibrios meet. The vibrios are killed by the contact of the air, the infusoria die in their turn as soon as they have consumed all the vibrios, and the work of destruction is then complete.

I have given this rapid sketch of some of the principal results of the researches of Pasteur in order that the influence of atmospheric germs upon our bodies in health and disease may be comprehended. Although the air contains the germs which are necessary for the processes of fermentation and putrefaction, these germs cannot be everywhere present in all forms and equal numbers. In some currents of air there are few, in others many; they are numerous in the lower strata, fewer and fewer as we rise higher and higher, and almost absent at the level of the snow-capped Alps. Air taken on the slopes of Mont Blanc was almost free from germs. On the chain of the Jura they were more numerous, and they increased in quantity as one descended into the valleys and approached inhabited places, becoming most abundant in the air of large cities, where an enormous quantity of organic matter is daily decomposed. Their influence upon the development and propagation of epidemic and contagious diseases has yet to be made out; but something has been done. Many years ago, Dr. Angus Smith led the way by his examination of the air of large cities and of crowded rooms, which other observers have carried on further. M. Chalvet found in the air of the wards of St. Louis a large quantity of starch corpuscles; and he collected a great deal of putrescible organic matter from the walls, windows, and bed curtains, and found that the linen returned from the laundry was still tainted by altered blood, pus, linseed-meal, and other organic

substances—probably as capable of infecting as threads charged with vaccine lymph. When watery vapour near a suppurating focus was condensed, it was found to be strongly charged with irregular corpuscles resembling dried pus; and Eiselt, of Prague, found small cells, like pus cells, in the air of a ward where epidemic ophthalmia was raging. The following extract from Chalvet's paper was given in the *British Medical Journal* for July 12, 1862:—

'The atmosphere of a Hospital is no longer a vague expression. The air of it differs essentially from pure air. In 1860 I witnessed the experiments of M. Réveil, and recognised in the most positive manner the presence of organic corpuscles in the apparatus constructed by that skilful chemist. We then observed chiefly cells and the *débris* of epithelial cells; corpuscles of divers forms, which became yellow under the action of nitric acid; and bits of charpie charged with these corpuscles. Under like conditions we saw, with M. Kallmann, in the laboratory of M. Réveil, organic *débris* incrusted with a granular substance, which gave the reaction of copper. The dust thus observed was collected in an ophthalmic Hospital where sulphate of copper was largely used as a caustic.

'Dust, collected by dusting the walls of the ward St. Augustine at St. Louis, furnished me with 36 per cent. of organic matter. At another period, in the laboratory of M. Réveil, dust collected from the same quarter yielded 46 per cent. of organic matters, which consisted in large part of epithelial cells, and yielded a horny smell when calcined.

'When wetted, the dusty powder quickly gives off a very fetid smell. Doubtless, the thick layer of dust covering the walls of our old Hospitals, may produce gases capable of favouring the transport through the air of corpuscles, which, perhaps, play a very important part in the air of Hospitals.'

When commenting on the spread of puerperal fever, M. Trousseau says:—

'These germs may not be developed as readily in all patients, because the conditions of their reception vary infinitely. Some patients, like certain earths, may not receive certain germs. The wind may spread the same seed widely over a country, and yet the grain will not spring up everywhere alike. Here the soil may be too wet; there too dry; here

other germs have grown up, and stifled the new seed. Just so is it with morbid germs and ferments. They, individually, require conditions favourable to their development.'

Carrying on the analogy between puerperal fever and purulent infection in the various forms which contribute so large a share to the excessive mortality after Surgical operations, and applying the knowledge for which we are indebted to Pasteur of the presence in the atmosphere of organic germs which will grow, develope, and multiply, under favourable conditions, it is easy to understand that some germs find their most appropriate nutriment in the secretions from wounds, or in pus, and that they so modify it as to convert it into a poison when absorbed —or that the germs after development, multiplication, and death, may form a putrid infecting matter—or that they may enter the blood and develope themselves, effecting in the process deadly changes in the circulating fluid.

That these low forms of animal life may seriously affect the blood of the higher orders of animals is clearly proved by the recent researches of Davaine, who has furnished us with the first well-established example of a disease of the blood due to the presence of inferior beings which are capable of development and multiplication in the torrent of the circulation. These creatures (*Bacteria*) differ from the whole class of infusoria which form in putrefied matter, as they disappear completely as soon as putrefaction of the blood commences. The Bacteria are rapid consumers of oxygen ; and when they exist in the blood they absorb the greater portion of the oxygen furnished by respiration, and thus hinder the combustion of all the effete and used-up substances which ought to be eliminated from the body. The blood, instead of nourishing the body, nourishes the parasites. Inoculation of animals with fresh blood which contains them leads to their development in the blood of the inoculated animal, not in any special organ. They consist of minute, straight, extremely fine filaments, varying in length from four- to twelve-thousandths of a millimeter, and have no spontaneous movement whatever. When the blood putrefies they become flexed in different directions, and then break up and disappear.

M. Davaine was first disposed to consider them as belonging to the filiform infusoria, the bacteria or vibriones, from

which they differed only in the absence of movements. In subsequent observation, however, he found a great number of these corpuscles of far greater length than that assigned to bacteria or even vibriones. He now believes that they cannot be properly classed with any of the known species; he considers them to be a well-defined species, resembling the filiform protozoa by their mode of generation and propagation, the filamentous confervæ in form, appearance, and dimensions, and certain ferments by the phenomena which they induce. M. Davaine proposes to term them provisionally merely bacterides. There are considerable varieties in the size of the bacterides observable, without any condition of the inoculated animals explaining the fact. Their number also greatly varies, from myriads found in some instances, to their rare occurrence in others. A very peculiar condition in animals affected with carbuncular disease is the disposition which exists for the globules of blood to become agglutinated to each other, so as to present little islets in the serum. When the blood infected with bacterides begins to putrefy, these agglutinated globules separate again. The blood of the capillaries is far richer in bacterides than is that of the large vessels; but they have not been found to have passed from the mother to the fœtus, although existing in prodigious numbers in the placenta. When putrefaction has commenced, and the bacterides can be no longer recognised, the blood ceases to possess the power of inoculating the carbuncular disease, although if used in sufficient quantity it may still cause the death of the animal, with other accompanying phenomena. The carbuncular disease, or splenic apoplexy, as observed in sheep, and which first led to the discovery of the bacterides in the blood, can only be transmitted by inoculation when the blood is fresh. The power which the blood possesses to communicate the disease continues for a longer or shorter time after death, according to the temperature, this faculty disappearing during the heat of summer in less than two days. Dried blood may retain the power of propagation provided it be rapidly dessicated prior to putrefaction; and it is highly probable that dried bacterides transmit the disease in flocks of sheep through the medium of the respiratory organs. The disease may, too, be transmitted by the agency of the digestive organs, though less certainly than by subcutaneous inoculation.

The duration of the period of incubation, after inoculation with fresh blood, has in Davaine's experiments varied with the size of the animal, but the rapidity of the occurrence of death has not been found to be in proportion to the number of bacterides produced. They multiply within a very few hours after they first appear, but cease to multiply after the death of the infected animal. Inoculated rabbits lived from eighteen to seventy-seven hours, a mean of forty hours; but only five hours after the bacterides appeared, thus giving thirty-five hours as the mean period of incubation. The blood in the heart and large vessels was found firmly coagulated.

In connection with these most important observations I cannot do more than allude to the recent researches on trichinosis, so beautifully demonstrated last night in the grand old hall of Gonville and Caius College, by Dr. Thudichum, which have already been so thoroughly worked out, and add so much to our knowledge of those diseases in the human subject which are caused by the inoculation, inspiration, or digestion of the ova or germs of lower animals. Nor need I refer to the admirable paper of Dr. John Harley on the endemic hæmaturia of the Cape of Good Hope, which he proved so conclusively to depend upon the development within the human body of the eggs of a parasite—one of the Trematode class of worms, and of the family Distomum. The dependence of various skin diseases upon the growth of vegetable parasites is now quite familiar to us all. The *Achorion Schönleini* is almost as universally recognised as the cause of Favus—the *Tricophyton* of Tinea Tonsurans—the *Microsporon Audouini* of Alopecia Areata—the *Microsporon furfur* of Pityriasis Versicolor, as is the *Acarus Scabiei* of scabies, *Pediculi* of some forms of prurigo,—or the *Entozoon folliculorum* of Acne. In all these instances, however, inoculation, or mediate or immediate contact, has been assumed, and it is only lately that the presence of living germs in the air, capable of reproducing contagious diseases, has been demonstrated. The honour of this important addition to our knowledge is due to M. Lemaire, who contrived an apparatus which conveys a current of air over the scalp affected with favus into receivers containing ice. In this way he was enabled to detect the achorion in the air itself so carried, and in the moisture which ensues upon its condensation in the refrigerators, and was

able to reproduce the disease by means of the achorion so obtained from the air. Still more important is Dr. Kennedy's curious case illustrating the production of measles by the inoculation or inhalation of the fungi given off from mouldy straw or linseed-meal; and Dr. Salisbury's corroborative proofs of the production of a disease like measles by inoculating the fungus —an inoculated disease which seems to protect patients from ordinary measles.

And here I should end with the mere suggestion that the Members of this Association may do good service in the cause of science by carrying out these observations, confirming or refuting, correcting or amplifying them. But the real practical end of all our work—the prevention and cure of disease—the lowering of excessive mortality—must not be lost sight of. And here, fortunately, the recent experiments of Polli, of Milan, on the action of sulphurous acid and the alkaline and earthy sulphites open to us a wide field for inquiry brightened by cheerful rays of hope.

In his work we first find a record of experiments on animals which prove—

1. That the injection of a certain quantity of pus into the blood produces pyæmia and affections characterised by multiple abscesses.

2. That the injection of putrid matter produces septicæmia, or putrid infection, characterised by the symptoms of typhoid gastro-enteritis.

3. That the injection into the blood of the exudative materials in contagious diseases, as in glanders, produces the general contagious affections.

In all these cases the introduction of the foreign substance or poison into the blood must be regarded as the origin of the disease, and Polli went on to inquire whether it would be possible to render the poison inactive, or neutralise it, without such an alteration of the properties of the blood as would endanger life. A great number of experiments upon the action of sulphurous acid and the alkaline and earthy sulphites showed that sulphurous acid prevents or arrests all known fermentations of organic matters as well as the putrefactive metamorphosis of animal tissue and liquids; having a much more energetic antiseptic action than arsenic or prussic acid, while it is not, like

these substances, poisonous. But the irritating effects of sulphurous acid on the mucous membrane led to experiments which showed that the sulphites of soda, potash, ammonia, magnesia, and lime could be given either in the solid or fluid form in efficacious doses; that they may be found in the urine even several hours after administration; and that the blood, flesh, and viscera of animals to whom they have been administered resist decomposition much longer than in non-sulphurised animals.

These results led to a therapeutical inquiry. If the administration of sulphites by the mouth could so modify the fluids and tissues of a living animal as to render its organic constituents more able to resist the putrid fermentation which they would naturally undergo after death, it was a rational hope that a similar effect would be manifested also during life, and that the living fluids and tissues charged with the sulphites would resist the action of morbid poisons which lead to an unnatural rapidity of putrefaction after death.

Having proved that the sulph*ites*, when given internally, are absorbed, and exert their specific action upon the blood and tissues during all the time necessary for their conversion into sulph*ates* by repeated passage through the lungs, and the elimination of the sulph*ates*;—and, further, that to secure the longest presence of the sulphites in the organism, or to retard their conversion into sulphates, it is useful to substitute the hyposulphites for the sulphites, as they require a longer oxydising process to convert them into sulphates,—the cautions are laid down—1, that they should be given as long as possible after food, unless it is especially desired to neutralise the fermentative action of the gastric and pancreatic juice; and, 2, that nothing containing citric, tartaric, malic, or oxalic acid should be taken after them, as these acids decompose the sulphites and hyposulphites, and set the sulphurous acid free. But acetic acid does not decompose these salts.

It then remained to prove that when the sulphites are administered to a living animal they really do alter the action of pus upon the blood, as well as that of putrid matters injected into the blood, or of a virus distinctly contagious and not putrid. By a large number of experiments on dogs, it seemed to be perfectly established that the sulphite or hyposulphite of soda really

did neutralise the effects both of pus, putrid matter, and the secretions in glanders, and without any ill effect upon the animal. The administration of those salts to children and adults showed that they are perfectly well borne by the human organism up to three or four drachms daily, and that this quantity is sufficient to prevent or arrest the action of morbid poisons.

I must refer to the work itself for any further account of these experiments; and, as it has not been translated from the original Italian, it is well worth the attention of the Council of the New Sydenham Society. But I may add, for the information of those who may be willing to carry on these observations, that the sulphite of magnesia in the solid form answers well for internal administration. It contains more sulphurous acid than other sulphites, and is not disagreeable. The sulphite of soda is disagreeable, easily decomposes, and is chiefly useful in solution for lotions or enemas. The sulphites of potash and ammonia are too disagreeable and changeable for Medical use. The hyposulphite of soda is not very disagreeable: its solubility makes it convenient for administration, but it is more adapted for prophylactic use than for severe cases, its action being much slower than that of the sulphites, as it must be converted into a nascent sulphite before the wished-for effect can be obtained.

Some cases of septicæmia in which I have given the hyposulphite of soda having been already brought before the Profession, I will now only add that the effects convinced me that it is a remedy of great value, well worthy of a general and extended trial. But I trust that no such exaggerated expectations will be entertained of its value, or of that of any other remedy, as could possibly lead any one to neglect those leading principles of sanitary science which should govern the size and construction of our Hospitals; or to overlook the lessons recently taught by Physiological Chemistry which confirm those sanitary principles —which teach us how easily our patients after surgical operations may be poisoned by any want of that attention which should always secure the most scrupulous cleanliness and purity of everything surrounding them—and which prove that a knowledge of principles and a practical supervision of details must be combined to enable us to recognise, avoid, prevent, or counteract the CAUSES OF EXCESSIVE MORTALITY.

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