with something which would prevent all harm to it from the acid in the lac plaster, which in its turn would widely overlap it in all directions, and prevent by its antiseptic influence the advent of mischief from without.

At first he tried covering the wound with thin black tin, afterwards with tinfoil, but the former was too rigid, while the latter were quickly into holes. Afterwards he devised "a protective plaster," the basis of which was the common oiled silk. The oiled silk was covered with gum copal and brushed over with a solution of dextrin.² Before being applied it was dipped in a solution of carbolic acid, which uniformly moistened and wetted its dextrin-coated surface, and ensured that it was actively antiseptic at the moment of application. This small amount of the acid soon became dissipated, and left "the protective plaster," an aseptic and unstimulating covering of the wound or line of incision, as the case might be. The lac plaster was so placed upon it as to overlap it widely in all directions.

This was the antiseptic dressing in use when Lister left Glasgow in the autumn of 1869.

The Results on the Practice of Surgery.

Although the period when Lister was thus developing his antiseptic system of treatment in Glasgow, extending as it did from March, 1865, until the autumn of 1869, was a very short one, it is hardly possible to exaggerate the changes which he accomplished in every department of surgical practice. To describe these in detail is impossible within the limits of this paper. Wounds were found to heal without inflammation, suppuration, or constitutional disturbance; compound fractures and dislocations were robbed of the former dangers which surrounded them; large chronic abscesses connected with bone disease were proved to be no longer incurable, even when occurring in the adult; arterial trunks were ligatured in their continuity without fear of secondary hæmorrhage or other mishap; joints opened, whether by accident or by the surgeon's knife, healed without a disquieting symptom; ununited fractures were treated boldly by removing the ends of the fragments in open wounds; and incursions were made with success into departments of practice which up to that date were looked upon as forbidden ground.

Two such operations I must mention, since they may be regarded as the first examples of what have now become common and established surgical procedures.

One was an osteotomy for the correction of deformity. A patient had had his foot driven outwards and backwards by the violence which occasioned a simple fracture of the fibula and internal malleolus four months before, and union had occurred with the foot in this faulty position. Relying on his recently-devised means of wound treatment, Lister divided the callus of both tibia and fibula, although knowing that in so doing he was opening the ankle-joint. The foot having been drawn forcibly into proper position and the wounds treated antiseptically, the patient recovered with a sound and useful foot.

The other case was one of carcinoma of the mamma with glandular disease high in the axilla, which occurred much about the same time (1867). Mr. Paget and Mr. Syme had both been consulted, and, in accordance with the practice of the day, had advised against any surgical interference. Having satisfied himself, by rehearsing the operation on the cadaver, that there was no insuperable anatomical difficulty in the way, Lister removed not merely the mamma, but also, I believe for the first time in the history of surgery, the whole of the axillary glands, dividing the pectoralis major muscle up to the clavicle, and cutting the minor entirely across. This great wound was conducted to a successful issue, and the lady lived for three years without any recurrence of disease in the part. She died of a metastatic tumour of the liver.

It only remains to be added that the effects of the new treatment upon the wards "were in the highest degree beneficial, converting them from some of the most unhealthy in the kingdom into models of healthiness."³

² Gum copal offers even stronger opposition to the passage of carbolic acid than does the oiled silk.

³ *The Effects of the Antiseptic System of Treatment upon the Salubrity of a Surgical Hospital.* Edinburgh: Edmonston and Douglas, 1870.

EDINBURGH ROYAL INFIRMARY, 1869-1877.

By JOHN CHIENE, C.B., F.R.C.S.Ed.,

Professor of Surgery in the University of Edinburgh.

The Chair of Clinical Surgery in Edinburgh and its Occupants.
In 1903 the chair of Clinical Surgery in the University of Edinburgh will have been established for one hundred years. Its first occupant, James Russell, held the position for thirty years. In 1833 he was succeeded by James Syme. In 1829, Mr. Syme, unable to get wards in the Royal Infirmary, had instituted a surgical hospital in Minto House. Dr. John Brown, Dr. Alex. Peddie, and Dr. Cornwall were his principal assistants. Dr. Peddie is now the Nestor of the profession in Edinburgh.

Mr. Syme held the chair of Clinical Surgery for thirty-six years, and retired in 1869. Joseph Lister, Syme's house-surgeon in 1855, and afterwards Assistant Surgeon and Lecturer on Surgery in the Extra-mural School, came from the Systematic Chair of Surgery in Glasgow University, and spent eight years in Edinburgh as Professor of Clinical Surgery, to be succeeded by Thomas Annandale in 1877.

In one hundred years four surgeons have held this important position, and it is my privilege to speak of the time from 1869-1877.

The Surgical Hospital in Edinburgh was built in 1777, and used as the Edinburgh High School for fifty-two years; it then became the Surgical Hospital, and was only vacated in 1880, when the new Edinburgh Royal Infirmary—a building with the beginnings of which Syme had much to do—was opened. The old hospital building is now the Edinburgh Fever Hospital, and is much altered internally. The old wards are still there, the little room where Mr. Syme used to meet his dressers, and the residents' room are now small wards. The theatre is now divided into wards. Externally the building is unaltered.

"The Germ Theory of Putrefaction: The Basis of a New Method of Treatment."

Joseph Lister was appointed in August, 1869. He began his official life as Professor of Clinical Surgery on November 8th by delivering his introductory lecture in the old chemistry class room. I was then Demonstrator of Anatomy with Professor Turner, who had succeeded Professor Goodsir in 1867, and I well remember that lecture. The large room was crowded, and the late Principal, Sir Alex. Grant, was in the chair. Mr. Syme was present, and received a great ovation from his old pupils. Mr. Lister said: "We may all rejoice that our old master is still among us to cheer us by his presence and aid us by his counsel." In 1896 Lister, when President of the British Association at the Liverpool meeting, spoke of Syme as the "safest surgeon of his time." Mr. Syme was not long spared, and some who read this will recall a sad day in June, 1870, when "our old master" was laid at rest in the burial ground to the east of St. John's Episcopal Chapel at the west end of Princes Street.

Lister devoted his introductory lecture to "an endeavour to convince" his hearers of "the truth of the germ theory of putrefaction," "the basis of a new method of treatment," "the antiseptic system." He told his students of Pasteur and his work, and during the years spent in Edinburgh he always spoke of Pasteur as his master, and when he represented Great Britain at the Pasteur Jubilee in 1892 he addressed Pasteur, and said: "Truly, in the whole world there does not exist any one to whom medical science owes more than to you." "Owing to you surgery has undergone a complete revolution."

Lister's Influence on Students.

At this time (1869) Mr. Lister had published five papers on Antiseptic Surgery, the outcome of his early investigations in Glasgow. His disciples then were few; the method he adopted was called by many the "carbolic acid system." In 1871, when he delivered the address on Surgery at the Plymouth meeting of the British Medical Association, it was said that "Professor Lister's solutions became weaker and weaker, while his faith appears to grow more and more." At that time the new doctrines were not in general favour.

amongst the profession. He had, however, in his students, and especially in his clerks and dressers, intense loyalty, and a mind able, ready, and willing to learn. He knew this from his experience in Glasgow, and he gave expression to this belief when he said to the Edinburgh students in November, 1869, "Gentlemen, I commend these facts to your candid and impartial judgement, beseeching you to form your own opinion regarding them." "The minds which you bring to bear upon the subject to-day are very much the same as they will be throughout your lives." "You are as competent as you ever will be to draw logical inferences from established data." He appealed, not in vain, to youth, and when he left Edinburgh in 1877 he willingly and gratefully acknowledged his indebtedness to his students for their loyal support. They deeply regretted, and did all they could to prevent, his departure to King's College Hospital, London.

There was no class in the University more regularly attended. Strangers from all parts came to Edinburgh to listen to his lectures, to see his practice; and there can be no doubt that the good work begun in Glasgow was consolidated and strengthened in the years spent in Edinburgh. It was my good fortune to hear very many of these lectures, first as a listener when I attended the hospital during my time of office as Demonstrator of Anatomy, and afterwards as Assistant Surgeon taking an active part in the daily work of the wards.

The Development of Modern Surgery.

The history of the gradual development of the surgery of the present day, and the great share which Lister had in that development, were told by him at Liverpool in 1896. How characteristic of the man is the remark: "I ask your indulgence if I have seemed to dwell too long on matters in which I have been personally concerned. I now gladly return to the labours of others."

It was in Glasgow that Lister began his investigations into the causes of death after accidental and operative wounds. In 1867, after he had been seven years a surgeon to the Glasgow Royal Infirmary, he published his first paper on antiseptic surgery, entitled *On a New Method of Treating Compound Fractures, Abscesses, etc., with Observations on the Conditions of Suppuration*.

At that time Mr. Syme was dressing his operation wounds and his compound fractures with dry lint, tying the arteries—he would not ligature a vein—with well-waxed silk ligatures, which hung ready for use in the buttonhole of the coat of his house-surgeon. The ligatures were left long, and brought out at the corners of the wound, acting as drains, but having to come away by a process of ulceration. The lint was generally removed on the second day, local uneasiness and a quick pulse—there were no clinical thermometers in those days—being the indications for its removal. Generally it was firmly adherent, and had to be removed by bathing with hot water,

or if it was very adherent a water dressing, wet lint and guttapercha, was applied for twenty-four hours to soften the primary dressing. Occasionally it remained on for a week or ten days. The wound had healed; the ligatures, however, had still to come away, and until that was accomplished the surgeon was anxious, fearing secondary hæmorrhage. Occasionally compound fractures healed by "scabbing." I still remember one case of compound fracture of the femur, in 1865, in which the lint remained on for six weeks. It was shown to the dressers as a case of rare interest. As a rule the wounds healed by second intention, and were syringed night and morning with weak Condy's fluid, a water dressing being applied to act as a mild poultice.

Compound fractures were the dread of surgeons, and amputation was the rule. Psoas abscesses were rarely opened freely, and valvular openings were adopted to prevent the entrance of the oxygen of the air, which was believed to be the danger. When I was house-surgeon in 1865, Mr. Syme frequently sent patients with large abscesses home unopened. Mr. Spence at that time was painting his operation wounds with tincture of iodine before stitching.

He applied no dressing, but left the stump lying on a piece of lint. He often got very good results. Pyæmia, however, was the dread of surgeons, and was believed to be due to the constitution of the patients. It often occurred in the most trivial cases—as varicocele, caries of the urethra, calculus—cases which I recall as a resident. During the six months when I was house-surgeon (1865-6) 13 patients died of pyæmia after operations.

Pasteur in 1858 had shown that putrefaction was due to organisms in the air. Lemaire in 1860 had tried carbolic acid in surgery, but his method received no support from the surgical world. Lister tells us that in 1864 he observed that carbolic acid had been used to disinfect the sewage of Carlisle, and he began experiments in the Glasgow Infirmary. He from the beginning accepted Pasteur's doctrines as the basis of his work, and I remember Mr. Syme showing us, I think in 1867, how Mr. Lister opened abscesses in Glasgow under a piece of lint soaked in carbolic oil. Carbolic oil was also used by Mr. Syme in compound fractures, and in 1868 he gave a clinical lecture on Lister's Doctrines, and said that they "opened up a new era in surgery."

There can be no doubt, however, that Lister's views, as enunciated on November 8th, 1869, came before the mass of the Edinburgh students as a new departure, and naturally much discussion took place, some upholding, some deciding, some sitting on the fence, all interested in the new doctrines.

Before Mr. Lister left Edinburgh the profession had, in the main, accepted his doctrines, and had attempted to follow out his practice. Failures "heartrending" Lister called them (as an old resident of Lister's at that time reminds me) were

The Old Surgical Hospital, Edinburgh, formerly the Royal High School, now the Fever Hospital.

frequent. With him it was failure due to himself—with others, a failure was due to the system.

During those years he was a very busy man, experimenting to prove the fallacy of the theory of spontaneous generation, experimenting on the coagulation of the blood, perfecting his dressings, first the lac plaster (then on its last legs); then the carbolic gauze, boracic acid, salicylic acid, and zinc chloride, were all tried as antiseptics; mackintosh cloth—first discovered by Mr. Syme—was used to spread the discharge and diminish the number of dressings. The "carbolic spray," first worked by the hand, then by the foot, and afterwards by steam, was in active use. In 1896, at Liverpool, Lister told us his reasons for discarding it in 1890. In 1881, at the Medical Congress in London, he spoke of giving it up. The late Mr. John Duncan gave up its use in 1884.

Next the wound Lister applied the oiled-silk protective, impermeable silk, coated with dextrine, copal varnish, and carbolic acid. Any blackening of this material, if accompanied by odour, was considered evidence that sepsis had occurred. Two things were however noticed: first, that people in whom sepsis—judging by the smell and the blackening of the protective—had taken place did not suffer any inconvenience, local or constitutional; secondly, that local uneasiness and constitutional disturbance were manifested without any evidence of sepsis in the wound. Such cases were at that time a great puzzle, until it was discovered that there were pathogenic and non-pathogenic organisms, and that putrefaction was only one form of fermentation, and that many of the worst varieties gave no local evidence of their presence, judging by the sense of smell and the blackening of the protective.

I cannot now fix any date for this discovery, but it must have been made before Lister left Edinburgh, because at that time I was an Extra-mural Lecturer on Surgery, and taught my class that the terms antiseptic and aseptic were too limited (looking to their strict etymology), referring only to sepsis or putrescence. I suggested the terms antitheric and atheric, in order to include all varieties of organismal fermentation, but the nomenclature has never been changed.

Lister spent much of his time in the study of the cases in his wards, paying special attention to the healing of wounds and the repair of ulcers, to the absorption of bone by granulation tissue, and to the changes that take place in an exposed blood clot in a wound following an aseptic course. Many of his pupils still recall the Sunday afternoons in the wards

when they received their first lessons in the first principles of clinical surgery.

He welcomed a compound fracture, and saved many a limb which in former days would have been amputated. He gladly admitted psoas abscesses and treated them successfully. Such cases naturally gravitated to his wards, and when he left Edinburgh he rented a house and put all his hospital cases of psoas abscesses under the care of the late Dr. Bishop, who told me some months afterwards that all these cases had been carried to a successful termination, and that he had that day sent home the last case soundly healed.

Lister did not hesitate to cut down on ununited fractures, excising the fibrous tissue and wiring the bones. He opened empyemata and used to demonstrate that air might pass freely into the cavity without causing sepsis. He opened joints in chronic synovitis and drained them. He incised tuberculous areas, carefully avoiding what is now known as "mixed infection." He removed loose bodies in joints by a free incision. In short, he did many things that were at that time considered as most dangerous proceedings and proved the truth of the doctrines which he had advocated from the early Glasgow days. He was always ready and willing—consistent with what he believed to be the safety of his patients—to modify and simplify his methods. He considered carbolic acid to be the most reliable antiseptic, but he fully recognized the disadvantages which follow its too free use in surgical practice.

Asepsis.

Even before he left Edinburgh he spoke of a time when he hoped to get rid of carbolic acid and avoid all irritation in wounds, and he often indicated that, after the carbolic acid in the deeper dressings had evaporated, the air space next the wound was aseptic. In other words, he looked forward to the

Professor Lister. From a photograph taken in 1869.

aseptic surgery of the present day.

It is well to recall this because some are now inclined to hold that the present-day surgery is a new departure. It is, in fact, the direct outcome of Lister's early work. Always a student, he was always ready and willing to learn, and in this way was an example to his most junior student. As the years roll on and I attempt to recall what happened nearly thirty years ago, I think I am within the mark when I say that he was a daily example to us all by his incessant industry, by his faith in the scientific basis on which he worked, and by his gentle kindness. How true during all these years was the last sentence of his introductory lecture: "Throughout the course on which we are now entering, I shall endeavour

as far as possible to place before you simple facts, trusting that in estimating their significance you will be ever guided by that which our dear master has so constantly striven to inculcate as our leading principle—the love of truth.”

When I compare the surgery of my student days with the surgery of to-day the outstanding impression on my mind is the amount of physical suffering which Lister has saved the human race. It is, in my opinion, incalculable. We hear often of lives and limbs saved; to my mind the pain saved is even more striking. Anaesthesia saved pain during, a sepsis after, an operation.

From first to last Lister's aim in Glasgow, Edinburgh, and in London has been to obtain if possible, a method whereby open wounds would follow the painless and safe course of a subcutaneous wound, in other words, follow an aseptic course. I sincerely trust that I have said nothing that will for a single moment give my dear master a passing thought that these reminiscences of past days had been better unsaid. Certainly I feel that they could have been better said, but I trust they may be looked upon simply as an expression, however incomplete, of the love and loyalty of a pupil for his master, and in no sense as an adequate record of Lister's work in Edinburgh.

LISTERISM AND THE DEVELOPMENT OF OPERATIVE SURGERY.

By W. WATSON CHEYNE, F.R.C.S., F.R.S.,

Senior Surgeon to King's College Hospital and Professor of Clinical Surgery in King's College.

DURING the winter session 1872-73 I first took out the course of clinical surgery at the University of Edinburgh, and there became acquainted with the subject of antiseptic surgery. Like many other Edinburgh students, I very soon became much fascinated with the work, not only with the actual healing of the wounds but even more with the enormous possibilities which were daily opening out under the protection of this treatment. During that time we constantly saw things done in the way of operative interference which were not in the books, or, if referred to, were spoken of as more or less unjustifiable procedures, and the consequence was that we watched these results with the very greatest interest. In fact, what went on in the Listerian wards was one of the chief topics of conversation among the students, and the classes were very largely attended and were most enthusiastic.

In the great importance of the revolution in wound treatment one is apt to lose sight of the fact that Lord Lister was also the pioneer in many of the modern operative procedures. Not only was he constantly employed in experiments and observations on wound treatment, and in improving and simplifying the methods according to experience and the advances of scientific knowledge, but he was also constantly engaged in modifying and developing various surgical procedures in the treatment of individual patients in reliance on the protection against sepsis afforded by this method. The same thought and ingenuity were brought to bear on the remedying of deformities and the treatment of disease as on the question of the avoidance of infection and suppuration of the wounds, and it was there that the chief attraction of his wards lay. As a matter of fact, Lord Lister looked on these new procedures as natural developments of the method of wound treatment employed; and, unfortunately, very little of his actual surgical work has been published.

I was so fascinated with his lectures and work that I took copious notes of everything that passed at the lectures, and I look on my notebook of clinical lectures for the sessions 1872 and 1873 as one of the most valuable possessions I have. On referring to these notes I find records of a number of cases which show the advanced state of surgical treatment in his wards at that time, and I may briefly refer to a few of these.

There were, for example, a number of operations on bones. There was a case of ununited fracture of the olecranon with considerable disability of the arm, where the part was cut down upon, the fibrous tissue removed from between the

fragments, and these wired together with silver wire. With regard to this case, I have the note that “the after-progress was satisfactory, and the man left the infirmary with a freely movable elbow as useful as the other.” I also find notes of cases of ununited fracture of the radius and of ununited fracture of the femur treated with success by free incision and wiring of the fragments, and there are cases of exostosis freely cut away, in opposition to the teaching which we received elsewhere, that unless these growths were causing very serious trouble they should not be touched, and that if touched some form of subcutaneous division should be employed. There is also a case of chronic periostitis and osteitis of the femur where the bone was cut down upon and portions removed by chisel and hammer, a method of treatment which in suitable cases has not been improved on up to the present time.

Then we had cases of scirrhus of the breast, where extensive operations were done with the view of removing the axillary contents, in some cases the pectoral muscles being divided so as to obtain complete access to this region. The operations then done were in fact as complete as any that have been performed up till recent times.

We had cases of psoas abscess treated by free incision and drainage, with the result that healing took place without suppuration or hectic fever, although naturally the treatment lasted for a very considerable time.

Then we had such smaller procedures as incision of a large haematoma, where the clot, instead of being absorbed, had developed into a blood cyst, and where, in opposition to the teaching of those days, an incision was made into the collection, a drainage tube introduced, and the wound healed up without any trouble. Similarly we had a case of housemaid's knee successfully treated by the introduction of a drainage tube—a procedure which at that time was also looked on as unwarrantable.

Perhaps the most interesting case which occurred during that winter session was one of suprapubic lithotomy. Some extremely interesting lectures were delivered on the treatment of calculus in the bladder, in which Lord Lister, after describing the methods of performing perineal lithotomy and the dangers accompanying them, took up the subject of suprapubic lithotomy. He referred to the work of Cheselden and others, and pointed out that what had been done in this direction seemed to show that the chief danger of the high operation lay in the occurrence of suppuration from extravasation of the urine, while he referred to the great advantages which might follow suprapubic cystotomy as compared with operations through the perineum. He further pointed out that, unless urine is septic, it is a bland fluid, and that with antiseptic treatment the great objection to this operation might be removed. On November 28th, 1872, he operated on a boy, aged 14, by the suprapubic method. The boy had suffered from symptoms of stone for eight years, and was in a very pitiable condition, and no doubt his bladder was considerably contracted. However that may be, in cutting down on the bladder the peritoneum was opened, but after consideration Lord Lister stitched up the opening in the peritoneum and completed the suprapubic operation. A large stone was removed, and the opening in the bladder wall was stitched up with catgut, these stitches being used as they are at the present time so as not to include the mucous membrane. No peritonitis followed the operation, the wound in the bladder remained perfectly firm, the boy passed water naturally, and in the course of about a couple of days was able to retain it for four hours. He completely recovered, although I should think from the description of the case that some slight sepsis did occur in the superficial wound: at any rate the superficial stitches gave way, and the wound healed by granulation. This case is extremely interesting, as it was really the commencement of the new era of suprapubic cystotomy, although it was not till a good many years afterwards that this operation was recognized as one of the best methods of obtaining access to the bladder. Had this case and the arguments in favour of the procedure been published at the time it is practically certain that Lister's name would have been associated with the modern reintroduction of suprapubic cystotomy.

Many other procedures were adopted which were also in advance of the times. We had cases—not apparently during