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A Retrospect of Surgery
during the Past Century.

John Poland, F.R.C.S.

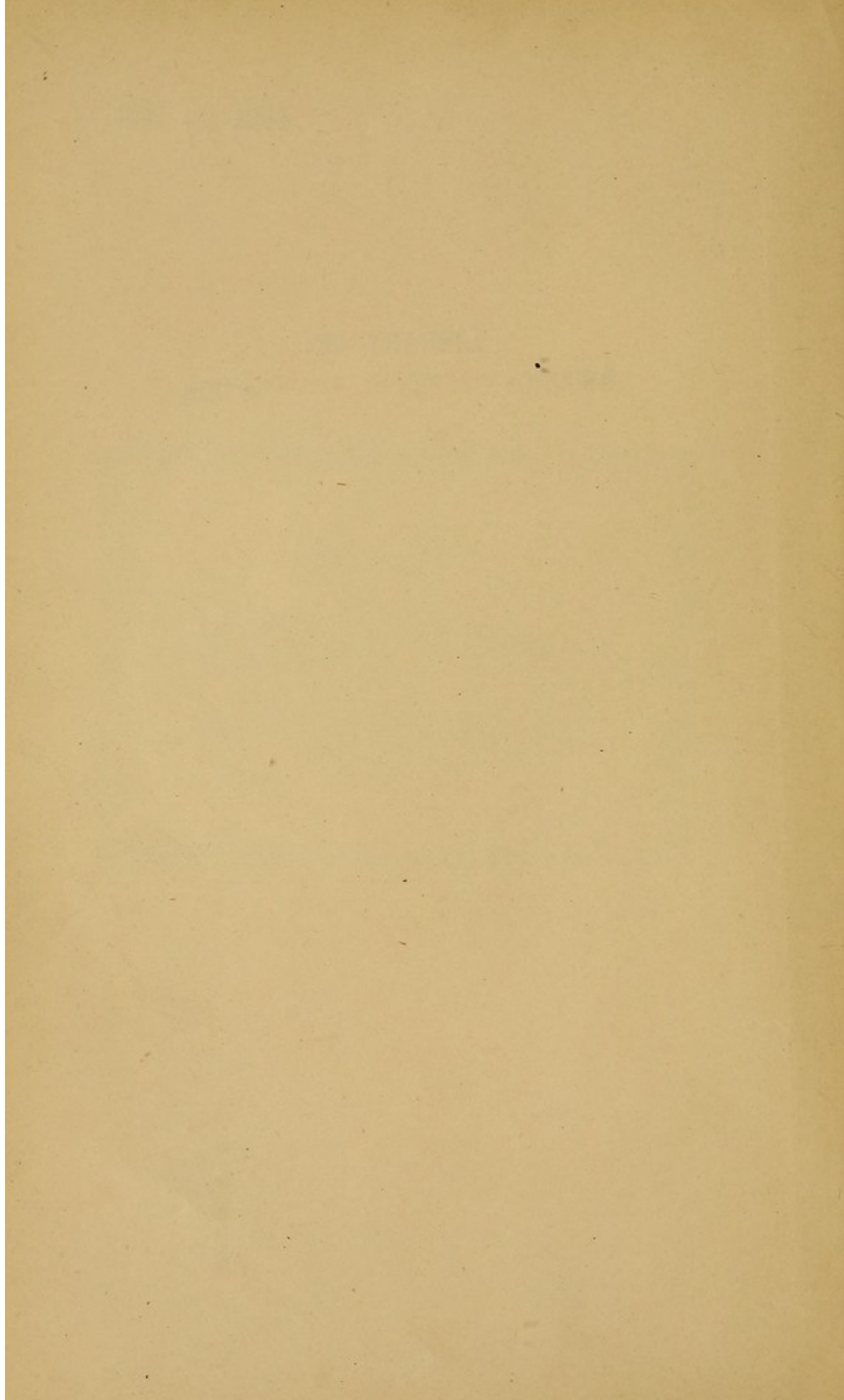
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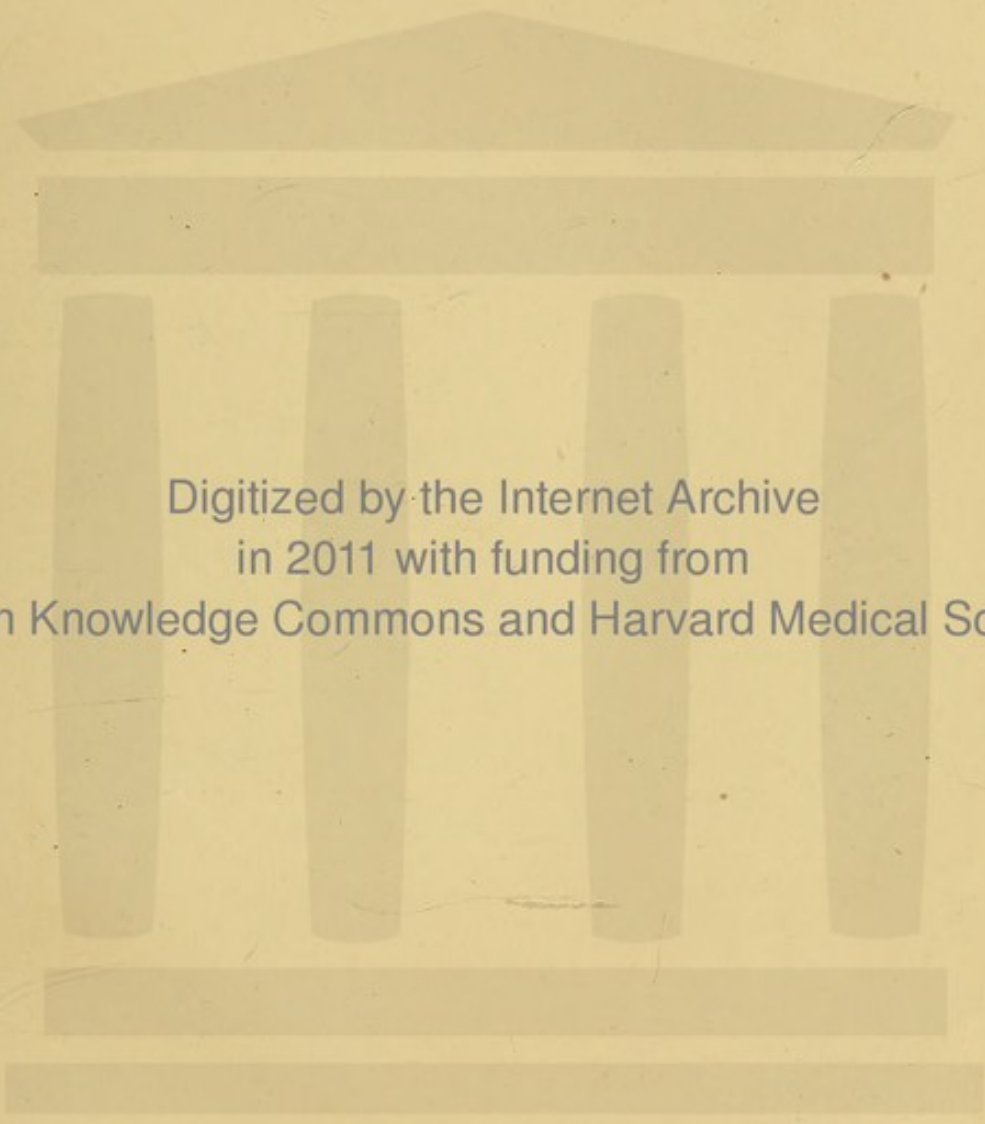
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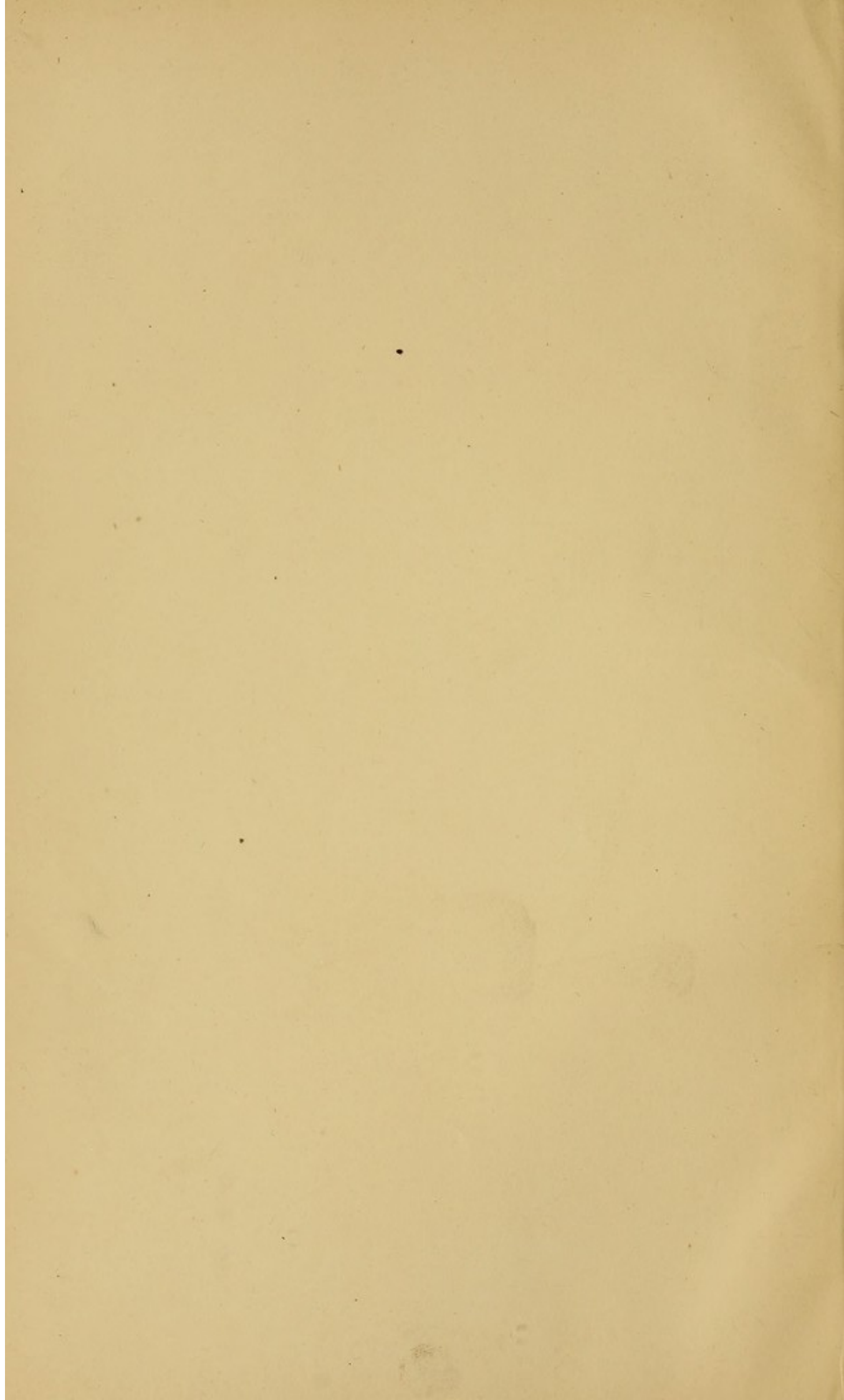
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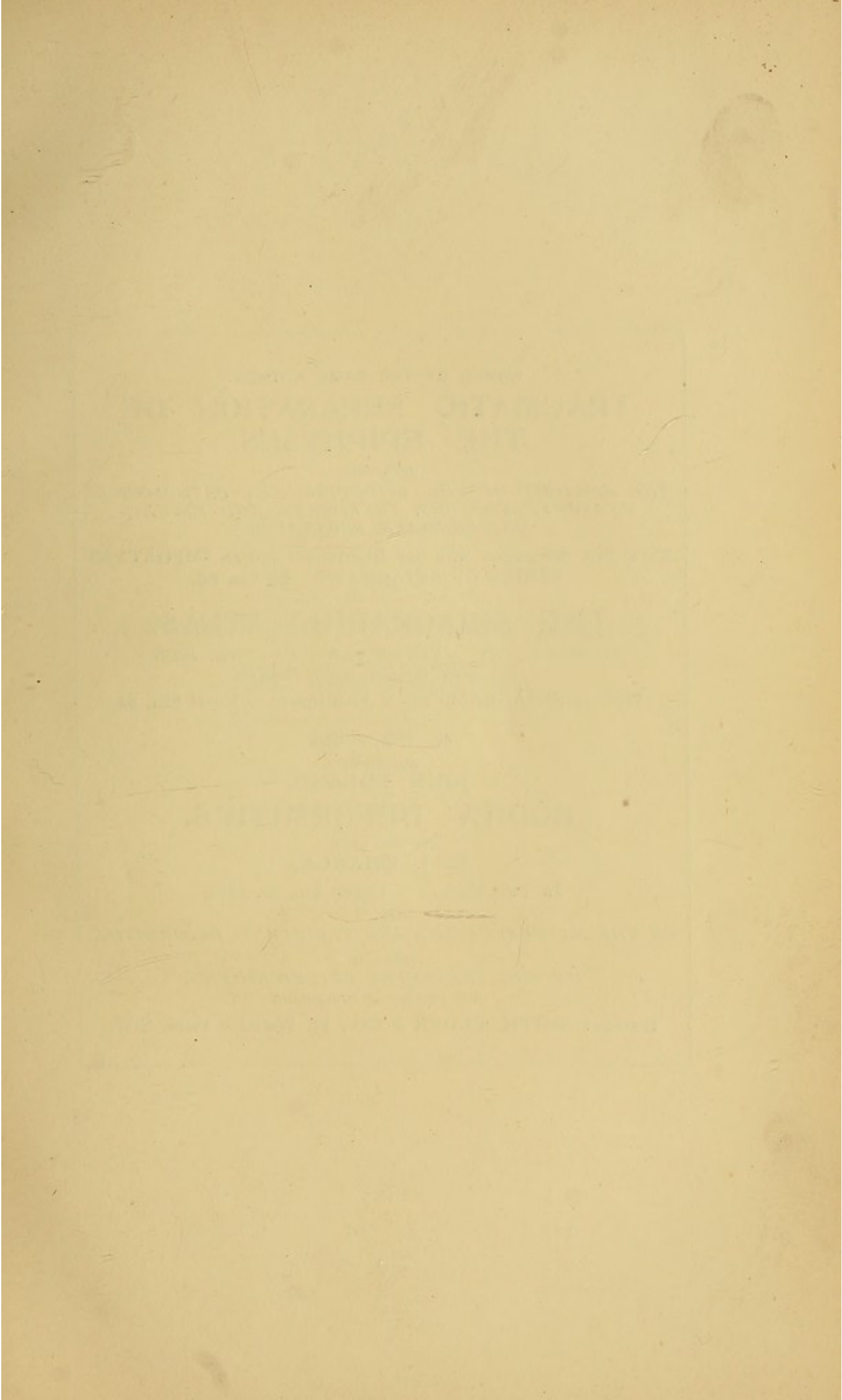
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DURING THE

PAST CENTURY.

BEING THE

HUNTERIAN ORATION

OF THE

HUNTERIAN SOCIETY, 1901.

BY

C
JOHN POLAND, F.R.C.S.

Surgeon to the City Orthopædic Hospital ;

Senior Surgeon to the Miller Hospital ;

Author of " Traumatic Separation of the Epiphyses,"

" Skiagraphic Atlas of the Hand and Wrist," &c., &c.,

Editor of " Bodily Deformities," by E. J. Chance.

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A Retrospect of Surgery during the Past Century.

MR. PRESIDENT AND GENTLEMEN,

At the commencement of the Twentieth Century I have no doubt that a brief review of surgical progress during the past hundred years will be acceptable to many of our younger members present this evening.

Although I cannot with any appropriateness choose some subject in illustration of the great work achieved by the eminent man whose memory we meet to celebrate to-day, that work having been so ably dealt with by many distinguished orators in this Chair, yet it seems to me that the passing away of one great period of time and the commencement of another is an occasion which may very fitly be marked by some such celebration as the present. I would first, however, advert to

the lamentable event with which the new Century opens. By the death of our venerable Sovereign, after sixty-four years' rule, "a reign has come to an end the splendour of which has no equal; a life is closed of which the beauty is unsurpassed." When Queen Victoria began her illustrious reign over this vast Empire, most of the greatest scientific discoveries and the greatest improvements made in our art, which I hope to notice this evening and which are now familiar to everyone, were unthought of or undeveloped. The Victorian Era will ever be remembered as the most glorious period in the annals of surgery.

The close of the Century almost marks the centenary of the death of the founder of scientific surgery, John Hunter, which took place in October, 1793, that is rather more than one hundred and seven years ago. Reference may here be made to the well-known fact that Richard Wiseman was the first great surgeon who placed surgery upon a basis distinct from that occupied by the physician. Sir Everard

Home, brother-in-law of John Hunter, in the first Hunterian oration at the Royal College of Surgeons in 1814, notes that Wiseman, whom he considered as the father of surgery, laid, in 1660, his experiences before the profession, and expressed his conviction after forty years' practice that surgery should be treated as a distinct branch from medicine. Hitherto it had been regarded as an art and a mystery, and the College of Physicians had remained in exclusive possession of the right of performing surgical operations. Wiseman broke the shackles wielded by the physicians. Home gives a good description of the progress of surgery from Wiseman's days, through those of Cheselden, Cæsar-Hawkins, Percivall Pott and Hunter, down to the date of his oration. But, compared with our own time, Wiseman's writings afford a sad view of practice. Henceforth surgery became a science, and it has now been elevated to a deservedly high rank among the sciences. Wiseman's work, as I have said, was continued by Sharpe, Percivall Pott and John Hunter in the Eighteenth Century; and

this fitly brings us down to the past century, during which it is perhaps not too much to say that surgery has made greater progress than in either of the preceding centuries, if not in both combined—progress which has been most marked during the last five decades. One half of this period is synchronous with my own personal experience of surgery, for I entered the profession twenty-eight years ago. To review in detail every improvement and achievement which has been effected during the Century in all departments would be a task simply Gargantuan. I can only, in the short time at my disposal, touch upon the more salient features of this gigantic subject. Our progress has been founded upon accurate anatomical and pathological knowledge, as taught by Haen of Vienna, Albertini of Bologna, and by John Hunter in the Eighteenth Century; and in the Nineteenth Century by Marest, Laënnec, Cruveilhier and Lobstein in France; by Meckel, Otto, Henle and Virchow in Germany; and by Sir Charles Bell, Baillie, Abercrombie,

Lee, Howship, Astley Cooper, Abernethy, France, Brodie, and finally by Sir James Paget in England; the latter of whom, fifty years ago, placed surgical pathology on a scientific basis. It is difficult to understand how a belief came to prevail before Paget's time that a knowledge of pathology was useless to the surgeon, whereas the value of pathology to surgery is now regarded as unquestionable. Look at the growth of the Hunterian Museum. The pathological specimens therein have more than doubled in number, while the skulls alone now amount to 3,000 instead of Hunter's fifty.¹ Among the various details of the late centenary of the Royal College of Surgeons I may allude to a list of lecturers and lectures at the College, recently compiled by the able librarian, Mr. G. V. Plarr. This list evidences many of the wonderful changes in the science and art of surgery, and in most of the allied branches of science, since these lectures were instituted

¹ See T. Holmes' Introductory Address, St. George's Hospital, "Centenary of John Hunter's Death," 1893.

at the instance of the legislature, when the Hunterian collection was handed over to the College, at the beginning of the past Century. And it is gratifying to note that most of the men of eminence in their respective departments are to be found on this list. One of John Hunter's great surgical masters, and one of England's greatest surgeons, was Percivall Pott, whose death took place towards the end of the Eighteenth Century, and whose merits as a classic writer¹ on so many practical subjects relating to his profession had a very great influence on surgery, extending into the past Century. Reverting to my opening sentences, I may say briefly that surgery at the present day has undergone an entire transformation, the change being not less rapid than complete, and so continuous that we cannot at present see finality. Who can predict what will be the retrospect in the year 2001 of the great achievements of surgery?

The greatest of all discoveries during the

¹ The Chirurgical Works of Percivall Pott, F.R.S., 1779.

past Century for the alleviation of pain in operations to prolong or save human life, is unquestionably that of anæsthesia. The methods of anæsthesia were first brought to light in the United States of America in October, 1846, and Bigelow says that in three months from that date "ether anæsthesia had spread all over the civilised world. No single announcement ever created so great and general excitement in so short a time. Surgeons, sufferers, scientific men, everybody united in simultaneous congratulation." Although Flourens, on March 8, 1847, discovered the anæsthetic action of chloroform, it was not until some months later, namely, on November 10, 1847, that Simpson of Edinburgh first employed it in practice. Dr. Elliston has quoted a description by Mr. William Cadge, who was present on the occasion of the first surgical operation in London under the influence of ether, which is interesting even to repeat here. Mr. Cadge says: "Robert Liston was the first surgeon in this country to use ether, and those who

were present at University College Hospital on December 21, 1846, and witnessed the complete and perfect success of that first venture, will not easily forget the dramatic character of that scene. I was present and assisted at the operation—amputation of the thigh by the double flap method. Someone present timed the operation. It took thirty seconds. The few arteries were tied and all signs of blood cleared away. A towel was then thrown over the stump and we watched anxiously for the patient to show that he was not dead; he presently woke up, and when asked once or twice if he could stand the pain of the operation he accused us of cruelly trifling with his feelings; and when the towel was removed and he saw the naked stump he burst into tears, and I thought Liston would do the same.” Even in those early days of anæsthesia, as no doubt you have all heard, our late beloved Queen acknowledged the value of chloroform by submitting in 1853, with the advice of her physicians, to be placed under its influence at the birth of

the late Duke of Albany, a fact which did much to dispel the prejudice that still attached to its use in obstetric practice. Anæsthesia allows the surgeon to perform his operations with great deliberation and slowness, the expenditure of time being of little consideration in many instances where thoroughness in completing an operation is the chief factor of a successful termination.

The new processes permitted by anæsthesia were impossible to practise, and were quite beyond the power of the surgeon before its introduction. Then, in amputating a limb of a conscious patient, he was harassed by the sufferer's groans as well as by his own sense of the pain he was inflicting. Now he is enabled to carry out with gentleness and the nicest exactitude all the various steps of a complicated operation. Yet it is much to be regretted that year by year, as the number of operations increases, the deaths from anæsthetics, chloroform especially, show no proportional diminution. The mortality registered as due to anæsthetics in England and Wales

is now more than double what it amounted to ten years ago.¹ We can only hope that this new Century will be productive of better teaching and better apparatus in connection with anæsthetics. The various agents employed in producing anæsthesia should also, I am convinced, be compared, more especially as regards their effects upon all sorts and conditions of men, women and children, at all periods of life. The preparation of the patients is also an important item in the administration of anæsthetics. It is noteworthy that deaths from chloroform in India are extremely rare, only three deaths out of 78·407 administrations, or one death in 26·000 cases, being recorded recently. One cannot help feeling that the growing importance of this subject has not hitherto received the measure of recognition which it assuredly deserves. I am one of those who think that an examination in anæsthetics as part of the final test for medical and surgical diplomas

¹ *British Medical Journal*, March 16, 1901.

has long been a desideratum. Every year a large number of men become qualified as physicians and surgeons with absolute ignorance of this important element of their profession. At the present time there is no uniform teaching of anæsthetics in Great Britain.

I may appropriately close these remarks with the concluding general statement of the recent important report of the Anæsthetics Committee of the British Medical Association. "From the evidence before the sub-committee they are convinced that by far the most important factor in the safe administration of anæsthetics is the experience which has been acquired by the administrator. In many cases the anæsthetisation completely transcends the operation in gravity and importance, and to ensure success, particularly in these cases, it is absolutely essential that an anæsthetist of large experience should conduct the administration."

The employment of cocaine, eucaine, and other like anæsthetic substances locally has proved of great use to the surgeon, especially in minor operations, but is more frequent in

Germany than in this country. The necessities of surgical practice often compel us to adopt these means of lessening the pain of operations in preference to general anæsthesia. Larger operations, such as amputation of the limbs, herniotomy, &c., have been performed under their influence, but general anæsthesia is still considered preferable in such cases. I need not occupy your attention further with this matter.

The Seventeenth Century saw the foundation of physiological knowledge by William Harvey. As the Eighteenth Century produced John Hunter, the profound biologist and anatomist, the founder of scientific surgery, so has the Nineteenth Century produced Joseph Lister, who is worthy to rank with Harvey and Hunter. Forty years ago Lister introduced the antiseptic system, which was attacked by medical men over the whole world. His theories were inspired by M. Pasteur's experiments in Paris, and the principle which guided him then has retained its full value down to the present time. The endeavour to carry it out

to the best advantage has been his chief life's work. To-day his untiring patience in research and his scientific methods have worked a complete revolution in modern surgery, and we are all proud of the facts that he has been created the first medical peer, and that he has only recently terminated five most successful years as President of the Royal Society. The foundation of the antiseptic system, like all great achievements in science, was not in any way accidental, as the term "discovery" usually implies, but was the outcome of long and patient labour. All the details of the causes of sepsis or of the invention of the earlier antiseptic methods adopted by Lister, his failures and successes during a long period of years before the principle of antiseptic surgery was accepted, it is not necessary for me to describe here, as they are so well known to all. But to give in brief an historical account of this I cannot do better than summarise Lord Lister's own words in an address delivered by him a few weeks ago, relating his earlier researches which

led up to the antiseptic system. Lord Lister¹ began his researches when a student at University College, and the picture that he drew of himself puzzling over what he observed in a case of pyæmia, and groping after an explanation of the process of inflammation, explains his after achievements. Even at that early date the idea flashed across his mind in a vague form that some factor of a parasitic nature was concerned in producing the phenomena he saw before him. But he did not waste his time in speculation. A true disciple of John Hunter, he followed the maxim "Do not think; try, be patient, be accurate." Being the fortunate possessor of an excellent microscope, which was given him by his father, he worked away, observing and experimenting, even on the bodies of sundry frogs. Anti-vivisectors may assert that Harvey did not discover the circulation of the blood by the aid of experiments on animals, although the evidence from a study of his works is decisively against them;

¹ *Standard*, October 3, 1900.

but they cannot explain away Lord Lister's record, nor, on the other hand, can they deny the vast benefits conferred on mankind by the result of his labours. When Lister left London for Edinburgh and became house surgeon to the Royal Infirmary he found "suppuration inevitably attendant on nearly every wound," and was led to continue his researches in inflammation with renewed ardour. Incidentally he lighted upon many interesting facts and problems which still remain unsolved. It was, however, to the question of suppuration of wounds that his attention continually returned. The most heroic remedies, as well as care in washing wounds and in the use of dressings, were tried in the attempt to grapple with the then terrible scourge of pyæmia; but everything proved useless, and there seemed nothing left but to accept the despairing theory that putrefaction was caused by oxygen itself. Then came Pasteur's demonstration that it was due to the fermentative action of micro-organisms in the air, which threw a flood of light on Lord Lister's previous observations, and showed him their true bearing.

My own experience—with regard to the introduction of antiseptics—during the last quarter of a century has shown me the marvellous influence that the antiseptic system has had, not only upon the actual progress of surgery in all its branches, but also upon the education of medical practitioners, students and nurses, the construction of hospitals and hospital wards, and even the management of hospitals themselves. In the early days of antiseptics I have had personal experience of the discussion about its methods and the improved statistics of operations that were then published. Attempts were then made to prove that as good results could be obtained by non-antiseptic procedures, and that in many instances of serious surgical operations, such as ovariectomy, herniotomy for strangulated hernia, &c., the mortality was largely influenced by the condition of the disease existing at the time of operation. This is true enough, but during the last quarter of the century we have seen the mortality from these very affections steadily diminishing.

There is no branch of surgery which has not

been affected by Lister's theory. Fortunate indeed is the surgeon who has had personal knowledge of the pre-antiseptic days, and who is still alive to carry out the practice of surgery according to the enlightened views of the present day. Although there was a great advance in surgical operations after the introduction of anæsthesia, yet for forty years or more subsequently the surgeon was deterred from performing many an operation, which he was convinced would be of great benefit to the patient, by dread of the septic complications certain to ensue, and so likely to be followed by death. It remained for the antiseptic treatment, with its absence of pyæmia and septicæmia, to perfect in a most effective manner the inestimable boon of anæsthesia.

As to asepsis, or the absence of germs which produce sepsis, I may say a few concluding words. When an aseptic condition has been brought about, the further application of antiseptics is useless, and may often be harmful. An operation wound clean and non-infected,

will heal best when washed only with water sterilised by boiling. The modern surgeon therefore endeavours to make and treat wounds aseptically, which means using the various methods of sterilisation, to render all apparatus, instruments, &c., free from bacteria. The skin sterilisation of patients and of the hands of the surgeon, though far from perfect, has of late years been improved day by day. Air is comparatively harmless to wounds, provided it is free from dust. Briefly, the most common sources of wound infection are air, water, the hands and person of the surgeon and his assistants, utensils, ligatures and instruments, which are brought into contact with the wound, and the patient's skin or secretions, such as mucus, saliva, urine or fæces. In practice it is assumed that all things are infected until they are known to be sterile—a golden rule, the strict observance of which would eliminate danger from instruments, sponges, ligatures, or other appliances. Whether complete ideal asepsis will ever be realised, is a question to be determined in the future. The most per-

fect wounds even now contain bacteria, often, however, of a harmless and non-poisonous character, or so few in number as to give rise to no trouble. Yet aseptic precautions have lately been carried somewhat to extremes. Thus, Mickulicz operates in gloves, and with a wet towel tied over the lower part of his face, for, as you know, it has been proved that even in quiet conversation bacteria are ejected in particles of saliva into the air surrounding the speaker. Mickulicz therefore prohibited talking; but as it is impossible to avoid saying a word occasionally during an operation, he and his assistants wear these moist towels round their mouths and noses, including the beard if they have one. The results of these precautions are said to have been most encouraging.

The number of surgical operations has enormously increased during my experience of the last quarter of the Century, and undoubtedly has been the direct result of the Listerian teaching. Results are obtained which not many years ago would have been looked upon as Utopian. Boyer, after the

Napoleonic wars, said that "surgery seems to have attained the highest degree of perfection of which it is capable." Also Sir John Erichsen said, in 1873,¹ "That there must be a final limit to development in this department of our profession there can be no doubt. The art of surgery is but the application of manipulative methods to the relief and cure of injury and disease. Like every other art, be it manipulative, plastic, or imitative, it can only be carried to a certain definite point of excellence. An art may be modified, it may be varied, but it cannot be perfected beyond certain attainable limits. And so it is, and indeed must be, with surgery. There cannot always be fresh fields for conquest by the knife ; there must be portions of the human frame that will ever remain sacred from its intrusion, at least in the surgeon's hands. That we have nearly, if not quite, reached these final limits, there can be little question." In another paragraph he says, "We have, as has already been seen,

¹ Introductory Address at University College, 1873.

carried the art of surgery to the highest degree of perfection of which, as an art, it is possible ; but although we have undoubtedly immensely improved on the rapidity, the precision, and the simplicity of our operations, we are constrained to admit that we have not succeeded in rendering them proportionately less fatal." To this observation on the mortality I will recur later on. The history of surgery, with its continuous progress, has proved the fallacy of the opinion of these two eminent surgeons. Bergmann said that "further progress in surgery could take place only through the increased knowledge of internal medicine." In this he was right in great measure, but the progress, which has been almost phenomenal during the last two decades, has been due primarily to the other causes just mentioned, namely, anæsthesia and antiseptic surgery. In 1800, 40 or 50 per cent. of patients died under surgical operations. This rate has been reduced to about 12 per cent. In Edinburgh Infirmary for the year 1897-8, the mortality

for all (2,666) operations amounts to only 6.201 per cent.¹

To turn first to the abdomen. In years gone by a wound of the peritoneum was looked upon with the gravest apprehension, and surgeons rarely opened the abdominal cavity. Even in strangulated hernia the question was always discussed whether the sac should be opened or not. The ancient dread of even a small incision into the peritoneum led to the belief that the success of the operation largely depended upon the possibility of avoiding doing so. It has often been alleged that the remarkable triumphs of abdominal surgery in recent days were evidently foreshadowed by John Hunter, although neither he nor his contemporaries appear to have had the opportunity of practice. Hunter says,² "How far in such cases" (suppurative peritonitis) "it might appear desirable to make an opening into the abdomen and

¹ *Edinburgh Hospital Reports*, vol. vi., 1900.

² "Works of John Hunter," by Jas. F. Palmer, vol. i., p. 446.

throw in warm water repeatedly to wash away the matter, I will not undertake at present to determine." Power¹ has gone so far as to state that "it may be said that nearly all the advances that have been made in surgery since the time of John Hunter may be found foreshadowed or suggested, or actually adopted, in his writings, experiments, and practice." Great have been the advances in abdominal surgery, and they have rapidly followed the successful practice of Spencer Wells, Thomas Keith and Lawson Tait, in proving that ovariectomy was no more dangerous than any other extraperitoneal operation. McDowell's first operation (ovariectomy) was performed in 1809. Careful cleansing of the peritoneal cavity after all abdominal operations is an essential proceeding, as well as the removal of blood, serum, or other injurious fluids, the products of disease or injury of the viscera. Peritonitis and septicæmia from absorption of decomposed fluid, were frequent causes of

¹ D'Arcy Power, "Hunterian Oration," p. 4.

death in former years. There is now not one of the abdominal viscera that is barred from contact with the surgeon's knife. Contrast this with what Samuel Cooper states at the beginning of the past century as regards the inevitably fatal traumatic rupture of an intestine: "When the wounded bowel lies within the cavity of the abdomen, no surgeon of the present day would have the rashness to think of attempting to expose the injured intestine for the purpose of sewing up the breach of continuity in it." Operations for ruptures of the intestines are now frequently performed with success. Yet, on the other hand, one cannot help thinking that exploratory abdominal operations should not be advised so frequently as they are at the present time for diagnostic purposes. Diagnosis will, I have no doubt, be facilitated in the future by a more careful consideration of symptoms and the acquisition of better means of judging than the surgeon possesses at present. In this respect it is evident that the technical attainments of the modern surgeon have far outstripped his powers of diagnosis.

Enterectomy, or excision of a portion of the intestines, is a well-established operation, but the amount of intestine which can be removed without serious detriment cannot as yet be determined. Moreover, the best method of uniting the severed parts is still a vexed question. The methods or appliances employed for the excision may be numbered by the hundred, and it would be futile for me to attempt any classification of them here. But it is a matter of interest to record now that a few recent operations have proved the possibility of excising the whole stomach itself successfully ; but whether this important viscus can be entirely dispensed with can scarcely be a question of certainty.

In *laparotomy* all surgeons now recognise that the peritoneum must be thoroughly cleansed, either by sponges or by Lawson Tait's water irrigation. Even perforating ulcers of the intestine in the course of typhoid fever have been successfully treated, and it is believed that surgical treatment of this hitherto fatal complication offers a very con-

siderable chance of success. Considerably over 100 cases of this operation have been recorded and the recoveries have amounted to rather less than 20 per cent.

The peritoneum, instead of being an enemy to the surgeon, is now regarded as his best friend when properly treated. Perhaps I may say, on the other hand, that familiarity has bred contempt, for laparotomy as an exploratory incision is now regarded as a slight one in the hands of competent surgeons. The risk is not great when it is properly performed, and recourse has therefore been had to it under this condition: "to clear up doubtful cases without any harmful result being likely to follow it."

Yet in all these triumphs of abdominal surgery there are "disappointments," which I think will be remedied in the future. Laparotomy for intussusception in infants, for instance, is very frequently unsuccessful. This is because some surgeons maintain that laparotomy in these young patients should always be preceded by an attempt at reduction by water injection or inflation. Notwithstanding

the fact that reduction does occur under the latter treatment, in the majority of cases it ends in failure, and then the child has to undergo the extra shock of its abdomen being opened, with too often a fatal result. Symptoms of obstruction frequently reappear and terminate fatally, although the intussusception has in the first instance been completely reduced.

Now I am strongly of opinion that if laparotomy be performed, especially in very young infants, say within a few hours after the commencement of symptoms of intussusception, and a small incision be made, reduction is easy, and the mortality in the future will be greatly diminished.

With regard to another very different phase of operative work, it is not so very long ago that surgeons took a sort of pride in amputation, but now the feeling is completely reversed; we look upon such a procedure with a certain amount of regret, just as John Hunter regarded it as a confession of failure. Of course in many instances of accident amputations must

always be an inevitable course to pursue, but in the case of disease it is different. It is, to say the least, a lamentable result, a real disaster to the patient, which displays a failure on the surgeon's part to relieve the affection. As to the mortality after amputation of all limbs, Erichsen gives the rate in 1873—twenty-eight years ago—"as at least one in three; in the largest metropolitan hospitals of Great Britain and in those of Paris, one in two; in Germany as nearly as possible the same. The average mortality after amputations of all four limbs, in the hands of men of the most consummate skill in the great centres of civilisation, varies from 30 to 50 per cent." The famous surgeon-in-chief of the French army, Baron Jean Larrey, at the commencement of the past century, says that his mortality amounted to only 25 per cent.; and although at that time anæsthesia or antiseptics were yet unheard of, one can easily accept this statement, seeing that he was the most brilliant operator of his time, and had immense experience in amputation. Moreover, he was an ardent advocate

of primary amputation, and in the wars of Napoleon it is said that on one occasion he amputated no fewer than 200 limbs in twenty-four hours. These statistics, however, although personal, represent a large mortality for all amputations, even at the present day. Fifteen years ago my own table of statistics of amputations for forty-two years inclusively, given in the *Guy's Hospital Reports* for 1888, recording 1,641 cases treated by the surgeons at Guy's Hospital, presented a percentage of 27·9. During the twelve years, 1875-1886, out of 214 cases of traumatic lesions there was a percentage of 30·06. The rate of mortality showed a marked diminution in the same class of case compared with 1860-1874, which was 47·8 per cent. This diminished death-rate was most marked on comparing the total results of amputations for twelve years (1875-1886) with the preceding fifteen years. Here in the total 782, the death-rate for all ages was 23·6 per cent. in the former, against that for 559 cases, 1860-1874, namely, 35·4 per cent. This was certainly due to the more careful

dressing of wounds and the introduction of the antiseptic system amongst some of the surgeons at this hospital. But the majority of the surgeons then still held to the older methods. The percentage of deaths from amputation has enormously decreased since that time, and it is seldom that a hospital surgeon loses a case of amputation except where the limb has been irreparably damaged by a complete crush, received very often many hours before it comes under his care.

The technique of amputations has been considerably simplified. The formation of flaps by transfixion is not so extensively practised now. Large oblique sections of muscles and soft parts are not at present made. Now a smaller transverse section is made, if possible. I may state that hospital gangrene, sloughing—phagedæna, erysipelas, pyæmia, tetanus, and secondary hæmorrhage, so common, alas, thirty years ago, are now rarely met with, since all surgeons in these days recognise such affections as due to bacterial infection, and always introduced

into our hospitals from wounds received outside.

As to the present treatment of nearly all surgical wounds, like structures are now united to like, as, for instance, in abdominal section : peritoneum is carefully joined to peritoneum, muscle to muscle, tendons to tendons, fascia to fascia, skin to skin, &c. Thus serried suture of divided tissues by soluble ligatures, the substitution of a closed for an open wound, under antiseptic methods, has been followed by almost universal primary union in all operations. This, though at a great expenditure of time on the part of the surgeon, is entirely due to the advent of modern antiseptic and aseptic methods, and is a great contrast to what I saw during my student days, when primary union of the whole wound after a major operation was never to be seen and never to be hoped for. The wound healed by granulation. Taking a case of divided nerves and tendons at the present day, these structures are carefully united to one another after a traumatism. Indeed, in

some instances of almost complete transverse division of the foot by a saw or glass I have been able to save the distal extremity by careful suturing of all structures ; whilst, as regards thoroughness of operations, complete and successful removal by Halstead's method of the pectoral muscles and the whole of the glands and fat of the axilla in cancer of the breast is one evidence of the recent view which finds general acceptance that cancer is of local origin. Again, hysterectomy for cancer of the womb is an operation which has produced the most brilliant results.

Let us now turn to the brain. Like many other organs and cavities, as, for example, the peritoneum, which not many years ago were regarded as dangerous to be interfered with and inaccessible to the surgeon's knife, the brain is now the seat of many bold and brilliant operations for the removal of tumours. This is largely due to the more accurate knowledge of the localisation of function of the brain, thanks to the labours of Ferrier and to the indefatigable perseverance of

MacEwen, Victor Horsley and others. In 1886 Horsley first published his directions for operating, and since that time operations for cerebral abscess following ear disease, or due to other causes, are of everyday occurrence. Encapsuled brain tumours, according to von Bergmann and most other observers, afford some of the best results in cerebral surgery. Operations for cerebral abscess, paralysis, epilepsy, tumours, &c., as you are aware, are now of so constant occurrence that it is possible that the Twentieth Century may see even cases of insanity amenable to the surgeon's art.

Excision of the Gasserian or Meckel's ganglion for neuralgia is another of the triumphs of recent surgery. Krause has operated on the Gasserian ganglion in twelve cases, with only one death. Ten were completely healed and remained free from pain.

As to operations on the spinal cord, laminectomy, or removal of some of the neural arches and exposure of the spinal membranes in the cord, has been frequently performed in

increasing paraplegia due to spinal caries, in tumours of the spinal cord and membranes, in pressure symptoms from compression by inflammatory products or blood effusion, in displacements of the spinal column, and in fractures of the neural arch.

Although apparently a small matter, the opening and clearing out of tuberculous and other abscesses has averted many a fatal result from exhaustion and hectic or lardaceous disease. An abscess in connection with spinal disease, namely, psoas, iliac, or lumbar abscess, may be treated by evacuation and removal of all inflammatory products after every point of the cavity has been reached and suitably closed by immediate suture, as first advocated by Barker. Perfect aseptic measures must always be carefully carried out, and after the cavity has been properly cleansed the interior should be irrigated thoroughly with iodoform solution.

Plastic operations of all kinds have reached a high point of perfection, whether the defects with the repair of which they are concerned

are congenital, or the result of disease or injury to the skin or other tissues. I must dismiss this subject by mentioning the excellent results which have followed suturing of the divided end of a nerve, with complete restoration of function.

Physiological operations—for example, castration, prostatectomy, vasotomy, vasectomy, for the cure of prostatic hypertrophy—have been too recently introduced for a definite opinion to be passed upon their ultimate success. Down to the present some good results have been recorded, and the patients have been greatly relieved of their difficulty of micturition. In the same way oöphorectomy for uterine fibroids and for incurable cancer of the breast is also still *sub judice*.

The operative treatment of all forms of hernia has been marked by most successful results since the introduction of modern methods of surgery, yet operations for *radical cure* were practised by the ancients and throughout the Middle Ages, until they fell into disrepute. About the Seventeenth Cen-

ture they passed more or less into the hands of quacks. Mr. Butlin quotes¹ Dionis, at the beginning of the Eighteenth Century, as giving an amusing account of the dexterity with which these men removed and concealed the testicle, under careful watching. He says, "We have known one of these operators who fed his dog with nothing but testicles, that animal always lying under the bed or under the table near his master, waiting for the luscious morsel, with which he was regaled immediately after its extirpation, unknown to the spectators, who would have sworn that the patient had all his parts."

The various methods of operation are almost legion, and possibly the best method has not yet been discovered, for the radical cure of hernia; but I may mention for inguinal hernia several procedures: (1) simple ligature of the neck of the sac and removal; (2) ligature of the neck of the sac and stitching up of the

¹ H. T. Butlin. The Cavendish Lecture on the Application of Pathology to Surgery.—*British Medical Journal*, June 30, 1900.

external ring (Czerny, Banks and Champonnière); (3) pleating of the sac, which is fixed as a pad at the upper end of the canal: suture of the canal (MacEwen); (4) torsion of the sac, with suture in the canal (Ball); (5) torsion of the sac, displacement of the neck, suture of the canal (Kocher); (6) removal of the whole sac, displacement of the cord, suture of the canal (Bassini, Halsted); the last operation is that generally adopted for this form of hernia, but for the femoral variety a more simple operation is sufficient, as No. 2 just mentioned.

Many of the methods are also employed in strangulated hernia without extra risk to the patient. Adding to herniotomy for strangulated hernia measures for preventing subsequent recurrence of the hernia does not increase the danger of the operation, but really diminishes many of the untoward risks. These I described as follows in the *Practitioner* of fourteen years ago, before excision of the sac was practised as it is now as a routine measure. I wrote: "We know from the experience of the

ovariotomist how important it is that the peritoneal cavity should be carefully and effectually closed by bringing the peritoneal surfaces into close contact. Why the peritoneum should be treated in a different way in hernia it is difficult to understand. This reasoning alone should be sufficient to condemn the old course of treatment in uncomplicated cases. Ligature of the neck of the sac as high as possible, with excision of the sac, was first advocated by Czerny ; the separation of the sac from the surrounding tissues is accomplished with the greatest ease in all hernias of recent origin, especially of the femoral variety. In older hernia this separation is not so easily performed and may lead to extensive sloughing or suppuration of the scrotal tissue, as I have seen in hernia of large size and of long standing. Yet notwithstanding this profuse suppuration of the wound, in no instance was there the slightest indication or fear of septic peritonitis. The peritoneum is shut off from the wound in the space of a few hours, and this, with the ligature, soon renders it

impossible for suppuration, however extensive, to pass into the peritoneal cavity. This closure of the neck of the sac has another great advantage: it effectually prevents all hæmorrhagic fluid from extending into the peritoneal cavity and its possible septic influence on it." I summed up very briefly in my paper the advantages of ligature of the neck with excision of the sac as follows:—

“Immediate.—(1) In many instances it does not add to the risk of the operation; (2) it shuts off the peritoneal cavity in a few hours; (3) it prevents hæmorrhagic oozing into the abdomen; (4) it prevents septic peritonitis.

“More remote.—(5) It adds a method of radical cure; (6) it leads to more perfect adjustment of the truss and comfort of the patient.”

The chief points that will have to be determined in the future are the mortality after operation, although this is exceedingly low, nearly 1 per cent.; the choice of operation with regard to permanent cure, the nature of the rupture and the surrounding parts, and

the mode of healing ; and lastly, and most important of all, the difference in operating on young children and adults. The ultimate results of all these operations are an unsatisfactory feature at the present day ; but according to my experience the dangers attending them are slight, and the immediate comfort and well-being of the patients cannot be ignored at the present.

With regard to other departments of abdominal surgery even the *liver* has until a few years ago been treated with great respect. The surgery of the liver, the gall bladder, and the bile passages I must not detain you with ; the lectures of Mr. Mayo Robson are so familiar to you and so comprehensive over this vast field of successful operations, that I need not particularise on any one of them. But I may state that hitherto only a few cases have been successful in which attempts have been made to treat surgical or traumatic laceration of the liver.

Operations for removal of stone from the kidney and nephrotomy for all purposes,

nephrectomy or removal of the kidney, are some of the most common operations at the present day. Yet Cooper, in his Surgical Dictionary at the beginning of the Century, says, "The operation of cutting a stone out of the kidney is a proceeding which perhaps has never been actually put into practice. There is no doubt that stones have often been extracted from abscesses about the region of the kidneys after their presence has been detected with the probe ; but with regard to cutting into the kidney the deep situation of this viscus and the want of symptoms by which the lodgment of a stone within it may be known, will always be strong objections to the practice." What a contrast this is to the brilliant achievements of Henry Morris, Clement Lucas, Knowsley Thornton, Bergmann, Greig Smith, Langenbüch and hosts of other surgeons at the present day!

Excision of the pylorus, which, as you know, was first performed in 1879 for malignant disease, is now successfully effected by many surgeons.

Passing now to perforating ulcer of the stomach, Mayo Robson, in his Lectures on the Surgery of the Stomach, has given statistics from 1880, when Mikulicz first operated. (Out of 429 cases of perforated ulcer treated by operation, 193 patients recovered and 236 died, a mortality of 55 per cent.) The length of time which has elapsed before performing the operation is the most important element in prognosis in cases of perforation treated by laparotomy. Excision of the ulcer is hopeful and may be employed unless adhesions are present or perforation has occurred. The surgical treatment of the complication of hæmorrhage from a gastric ulcer is as yet in an unsettled state. Although laparotomy has been performed in many instances in acute hæmorrhage, it will probably be more successful in chronic and persistent hæmorrhage. The excision of the ulcer under these conditions has been effected with a certain amount of success down to the present time. Gastro-enterostomy for the relief of ulcer of the stomach is one of the most recent

operations recommended, and has been carried out so satisfactorily that it should be more often resorted to, especially in multiple ulcer and when the bleeding point cannot be found. It relieves the patient of all his distressing symptoms and allows the ulcer to heal. Looking at all these operations, we may justly say that the stomach appears of recent years to have been the most fertile source of abdominal operations. I need only refer to the recent articles by Mayo Robson and Barker in illustration of the great progress that has been made during the last ten years in dealing successfully by surgical procedure with these many and grave diseases of the stomach, otherwise incurable and often fatal.

Perforated *ulcer of the duodenum* has also been successfully operated and sutured on many occasions, presenting another illustration of the good results which we expect nowadays to follow early operations in cases of perforation of the hollow viscera.

Operations for *appendicitis* have been somewhat a fashionable craze of late, not that I

wish to disparage them, for without doubt very many valuable lives have been saved by timely removal of the appendix. Indeed, in almost every case of appendicitis there is a time in which recovery is only possible by operation. The earlier the operation is performed the better is the prognosis and the more certain the recovery, which is radical. Unfortunately the operation is too often performed too late. One word as to recent diagnosis: Robin¹ maintains that a blood count plays an important part in the diagnosis of suppurative appendicitis. The normal proportion of white (5,000-10,000 per cubic millimetre) blood corpuscles is 1 to 300 or 1 to 700 red, somewhat higher in women and considerably higher in infants. Pathological hyperleucocytosis takes place in the following surgical diseases, hæmorrhage, diphtheria, tonsillitis, secondary syphilis, erysipelas, puerperal and other septicæmic states, glanders, septic and cerebro-spinal meningitis, infection of the gall

¹ *Medical Record*, New York, October 27, 1900, p. 652.

bladder, perinephritic abscess, acute pancreatitis, some acute cases of cystitis, gonorrhœa, all kinds of abscess formation, as in osteomyelitis, gangrenous inflammations and malignant ulcer of the stomach. Diminution in the number of leucocytes takes place in fasting and mal-nutrition, and in some infective diseases, such as typhoid fever, malaria, influenza, mumps, and tuberculosis, except in advanced stages. It is thus seen that a white blood count will often help in the diagnosis of one or other disease. A sudden hyperleucocytosis in the course of typhoid fever will point to a complication, and if accompanied by sudden onset of pain in the abdomen will be sufficient to justify an exploratory incision. Hyperleucocytosis will at once differentiate a suppurative appendicitis from simple colic, typhoid fever, ovarian neuralgia, impaction of fæces and floating kidney. Developed during the course of catarrhal appendicitis it will point to suppuration with as much precision as any of the diagnostic signs in our possession. Average cases of appendicitis or abscess show

from 15 to 30,000 leucocytes to the cubic millimetre. Counts larger than this mean a case of the greatest severity, while catarrhal appendicitis does not raise the count above 15,000.

I may dismiss the question of the numerous operations on the *bladder* by stating that suprapubic cystotomy has entirely superseded the perineal operation for stone, for tumours, for cystitis, for tuberculous disease and for prostatic hypertrophy.

As to the surgery of the *lungs*, operations for empyema, removal of gangrenous portions of the lungs, washing out tuberculous cavities, are most successfully performed. Wounds of the lung have also been favourably operated on by free incision and suturing. Pneumotomy will probably in the future have a much more extended field.

With regard to the *heart* many instances of surgical interference with it have been recently recorded. Wounds of the ventricle have been treated by free exposure of the injured organ, involving the resection or turn-

ing back of three or four ribs and closure of the cardiac wounds by sutures, and have in this way been completely cured. These last operations have been added, I may state, during the lustrum just ended. For many years cases of suppurative pericarditis have been successfully treated by incision and drainage.

The great progress that has been made in ophthalmic and laryngeal surgery is due, as in all the subjects already mentioned, to the more accurate methods of diagnosis and the scientific appliances which have rendered these possible.

Turning to another phase, there is not the repugnance to operation in either private or hospital practice that there was in my student days. The usual question of a patient now is, "Do you recommend an operation in my case"? and oftentimes this question is asked before the surgeon has had time to consider whether an operation is needed.

It might be thought with all these brilliant successes in surgical procedures that the

aggregate percentage of death from operations would be greatly decreased. This is not the fact ; it has increased, the reason being that the number of surgical operations is so notably augmented. The physician now hands over to the surgeon for operation, patients affected with carcinoma of the pylorus, severe intestinal obstruction, obscure brain disorders, and tumours of the pancreas, kidney, liver, and bladder, many of whom would formerly have been allowed to die without the chance of complete recovery which they now have.

Twenty-five years ago all must recollect the constant occurrence of pyæmia and septicæmia, of suppurative inflammation in wounds and their bearing on pathology, as taught at that time, while now suppuration is considered as a disgrace to our operations ; not that all true inflammation is absent from our wounds, however aseptic they may be. Our views with regard to inflammatory processes have undergone a complete revolution since the time that John Hunter studied these with much labour, more than a hundred years ago.

One word in concluding my observations on the present condition of surgery as an art. I do not think that the manipulative part of our profession has progressed as it should have done since John Hunter's days. It has been said that much of the manipulative skill and dexterity of this great surgeon in operating, dissecting and making preparations, &c., was owing to his apprenticeship as a cabinet maker. We do not find the same manual dexterity among modern surgeons. I have seen more than one eminent surgeon make a lamentable exhibition while sawing through a bone in an amputation when it was manifest from the splintering of the bone and the repeated locking of the saw that the surgeon had never used a saw in a carpenter's shop. I would not go so far as the late Mr. Lawson Tait, in advising that a course of carpentry should be added to the present over-burdened curriculum, but I think that all should avail themselves in early youth of the opportunities of learning to use a saw and handle a chisel and hammer in the carpenter's shop, such as now

exist in our public schools. It is interesting to note that Samuel Cooper in his "Dictionary of Practical Surgery" at the commencement of the past Century, refers to this subject as follows: "In no part of the operation of amputation do operators in general display more awkwardness than in sawing the bone. It is one of the most common remarks of such persons as are in the habit of frequently seeing amputations, that the part of these operations which a plain carpenter would do well foils the skill of a consummate surgeon, and few operators acquit themselves well in using the saw."

The manual dexterity of the surgeon of the present day is also in danger of undergoing deterioration by reason of the multiplicity of instruments of diagnosis, such as the aspirator and exploring needle, or even by the too frequent employment of exploratory incisions or laparotomy.

But to show what a vast change has come over the technique of surgical work during the past thirty years, I will quote Fergusson's

words in 1867. He says: "I remember, when venesection was practised more than at the present time, that the operator was considered a bungler if he let a drop of blood be seen after the basin was taken away, and I have often thought that it would be well if such an idea could be impressed on those alluded to, who seem, as it were, to gloat on the sight of blood. He may consider himself a happy man who can boast of clean hands in this world of turmoil. One would think that a surgeon, in this part of his duties, might at all events set to work with a clean conscience in this respect. Yet I have seen a man of fame proceed from one operation to another with his hands covered with the first patient's blood." What a contrast this is to the practice of the present time!

The *bacteriological* discoveries of Pasteur, Koch and their disciples, have been the means of placing our surgical procedures and treatment upon an entirely new basis, completely revolutionising surgery. The last few years of the expired Century have seen this vast

change effected with regard to infective disease—a change due to the indefatigable co-operation of the laboratory worker and the clinician.

The germ theory of disease, which was, not many years ago, looked upon as chimerical, may in the future be the high road to the ultimate extermination of all infectious disease. The study of bacteriology, although comparatively new, has developed into a real science; it now extends beyond the limits of medicine and surgery to manufacturing and agricultural industries of all kinds, and even to the disposal of town sewage. Indeed, in its extension and application, it seems destined henceforth to occupy the undivided attention and energies of the specialist. Bacteriological diagnosis in infectious disease (more especially diphtheria and typhoid fever) has been much discussed of late years, and the majority of important sanitary authorities have already equipped, or are on the point of equipping, their Public Health Departments with appropriate means of pursuing it. The importance of securing an early and certain diagnosis in such diseases as

diphtheria, typhoid fever, and it may be added tuberculosis, is the first step in the prevention of their spread, and a means whereby much good must ultimately accrue when medical practitioners have realised the great help that bacteriology affords them.¹

There is another subject to which a cursory reference will suffice, as we know at present very little about it, or of the place it is to occupy in therapeutics, viz., the action of *antitoxins* or preventive fluids by which the human being may be rendered immune against infectious disease. Such knowledge of it as we possess is the result of researches in bacteriology and pathology, but its development received a severe check a few years ago in the premature announcement of Koch's discovery of the tuberculin antitoxin, so that the real merits of tuberculin could not be investigated before the public became too hopeful over the process, only to experience disappointment. This "serum treatment" has

¹ *Medical Annual*, 1899.

already proved of incalculable worth in averting or diminishing many of the untoward accompaniments of such terrible diseases as diphtheria and tetanus. In the latter disease our experience has already shown that the antitoxin should be administered early in small doses before too much of the toxin has been absorbed from the wound. Antitoxin treatment must of course be combined with antiseptic or other surgical treatment to prevent such absorption. It is to be hoped that this important matter of antitoxin treatment, which even thus early is one of the most successful curative methods in these deadly diseases, will before long elicit the more careful attention of the profession and of the general public. The purity of the serum (which I do not at present wish to impugn) should be officially tested and guaranteed by the Government. It may here be remarked by the way that tetanus, as a complication of a surgical operation, is now exceedingly rare; this is doubtless due to the great care taken to guard against sepsis in every opera-

tion. In concluding this subject I may add that Lord Lister, with his world-encompassing genius, has directed his attention to the researches on the parasitology of *malaria*, which have been recently made with the object of unravelling the mystery of the greatest scourge of our tropical colonies, and to the steps that advancing knowledge has suggested for its suppression. Some of us, perhaps, who are nearing the venerable age of Lord Lister, do not adequately appreciate or comprehend this new development of science. It is probable, also, that yellow fever is communicated to men by the bites of mosquitoes, but as yet this has not been conclusively proved.

The establishment of bacteriological laboratories throughout the kingdom is an index of the improvement of this branch of medical education for the detection of plague and many other forms of disease.

Let us pass now to the subject of *fractures*.

Percivall Pott, in his remarks on Fractures and Dislocations,¹ says that "the parts or

¹ The Chirurgical Works of Percivall Pott, 1775.

powers which act on the bones producing displacement of the fragments, shortening, and resistance to reduction, are the muscles. Although all bones when broken are in some degree displaced and shortened, yet it will always be found that in proportion as the muscles surrounding or in connection with a bone are strong or numerous, or put into action by inadvertence or spasm, so will the displacement of the ends of such bone, when fractured, be. The even and smooth position of the fractured ends of the tibia when the fibula of the same leg is entire or unhurt, that is, when the muscles therefore cannot act upon the former; the visible and immediate deformity when both the before-mentioned bones are broken in the same place, that is, when the muscles can act upon and displace such fracture; the great difficulty frequently met with in endeavouring to get a broken os femoris to lie even tolerably smooth, and to prevent such broken limb from being much shorter than the other, are, among others which might be produced, such strong and

irrefragable proofs as need no comment. From the muscles, and from them only, proceeds all the difficulty which we meet with in making our extension, and by the resistance of these *and these only* are we prevented from being always able to put the ends of the fractured bones immediately into the most apt contact."

We now know that the difficulty of reduction is not mainly due to muscular contraction, but to the penetration of muscles and fasciæ and other soft structures by one or other fragment, to the interposition between the fragments of splinters of bone and of muscle, and to effusion of blood. I may at once say that the methods of dealing with fractures are old and empirical; these injuries ought to be treated in a far more scientific manner than they are at times. It is not the methods which are at fault, but the principles actuating their employment. The treatment of fractures has been a matter of routine for very many years, and it is only lately that it has undergone any modification, as in so many departments of

surgery, by the influence of asepsis and other modern advances.

While recognising that early massage and ordinary methods of treatment, followed by an early recourse to movement, are all that is required in the majority of simple fractures to effect a good result in the function of the limb, I am bound to admit that in many cases the disability is undoubtedly very great and often permanent. In simple fracture of the patella, for example, a certain loss of function in some instances may be great and should necessitate in suitable cases an open incision and wiring together of the fragments. Particular forms of fracture of the long bones are now dealt with by operative procedure. Severe displacements of the fragments in so-called simple (or closed) fracture and cases in which it is quite impossible by manipulation to replace exactly the fragments in their original position, are now subjected to free exposure by an incision and the fragments brought together by suture or screws or by some other method of keeping them in position. The

risk of such operations must be restricted to these particular instances, and as for the position of the fragments which renders them justifiable, skiagrams are now taken of the limb from two points of view. Complete restitution and not merely union in any position must be arrived at, whether by mechanical means, as in Colles' fracture, or by operation, as I have said, in the more difficult fractures. In *compound fractures*, even where large articulations are opened, we never amputate nowadays provided the circulation can be carried on in the limb. Every part is cleansed, the soiled portions removed most thoroughly, like structures are united to like by suture, and the wound heals like a simple fracture. Take, for instance, compound fracture of the patella, which some years ago was almost always followed by pyæmia or amputation. Many limbs and lives are now saved by careful cleansing and wiring together of the fragments. At the present day we convert a so-called simple fracture of the patella into a compound one, especially in cases where

the bone is comminuted and the fragments are widely separated as a result of direct violence. I have given many instances in a paper written five years ago¹ on the "Treatment of Fractures of the Patella," where I direct attention to a detailed analysis of eighty-four cases of compound fracture of the patella, by the late Alfred Poland,² in 1870. It is an interesting comparison with the results of modern surgery a quarter of a century later, the date of my paper.

With regard to the *separation of the epiphyses*, it is a remarkable fact that John Hunter in none of his published works mentions the occurrence of this lesion, although so many writers before his time had alluded to its possibility. I have endeavoured, as you know, in my recent book on "Traumatic Separation of the Epiphyses," to place these

¹ *The Hospital*, February 15, 1896.

² *The Royal Medical and Chirurgical Society's Transactions*, 1870.

³ John Poland, "Traumatic Separation of the Epiphyses," 1898.

important lesions upon a sound and satisfactory basis. I have there traced the history of the subject from the time of Hippocrates, who apparently refers to this lesion in one passage, where in speaking of dislocation of the wrist he says that this epiphysis is sometimes displaced; his exact meaning, however, cannot now be determined. There is a much more definite reference in the work of Realdus Columbus in 1559, and from that time to the present the references in surgical literature increase in frequency, while those occurring in the scattered writings of surgeons of the past Century alone would fill many chapters. Only half a century ago, in 1850, Dr. A. Coulon of Paris, in a treatise on "Fractures in Children," denied, like many others, the existence of these injuries. Other writers, while not questioning their occurrence, considered them to be so rare as to be of little practical importance. During the last two decades it has been more generally acknowledged that these injuries are by no means rare, and Dr. Curtillet in 1891 con-

sidered that 20 per cent. of all fractures in children were really cases of separation of an epiphysis. However, even at the present day we find that there are still very conflicting opinions, one surgeon detecting these injuries very frequently while another never does so, or only admits that they are rarely met with. It is most gratifying to me to note the high estimate entertained of my work by my critics, and I should like to take this opportunity of thanking the profession for the many kind expressions of appreciation which I have received.

I will conclude these remarks on fractures by drawing attention to their treatment and to that of epiphysial separation at the elbow joint in children. Most writers have hitherto discussed the treatment of fracture at the elbow joint in children *en bloc*. They speak of treatment by the extended or the flexed position, or by any other method, quite irrespectively of the exact nature of the lesion or the displacement of the fragments. It seems to me quite irrational to treat all frac-

tures at the elbow by one particular method, but this is what is being done at the present day. It is absurd to treat the condylo-trochlear or oblique fracture on the inner side with, for instance, upward displacement, in the same way as a condylo-capitellar fracture on the outer side. This want of discrimination between the different modes of treatment I believe to be due to our ignorance of the injuries of the elbow joint in children, owing to the paucity in our Museums of specimens of separation or fracture of the lower end of the humerus, of oblique, external or internal fracture of the humerus, of separation of the upper end of the radius or ulna, and even of the more simple fractures of the diaphysis in this region. These are comparatively a small collection out of the very great variety of injuries proved by everyday experience to exist at the elbow joint, not to speak of the Röntgen process, which has revealed a large and varied number of lesions which were not even thought of before. The Röntgen process has also confirmed what I

have for many years insisted upon, viz., that a portion of bone or an epiphysis may not only be detached and displaced in a downward, upward, lateral, or any other direction, but also be more or less completely rotated on one or other of its axes. I have had numerous examples of this, as, for instance, in fracture of the neck of the radius, and of one or other of the epiphyses of the lower end of the humerus.

This leads me to mention here the little-recognised fact that a fracture or separation of one or other of the bones at the elbow joint is so often associated with dislocation. Often the dislocation is recognised while the fracture or separation is entirely over-looked. In my work on the epiphyses I have endeavoured to place these injuries at the elbow upon a satisfactory basis by classifying them according to their pathological anatomy. If we can determine exactly the nature of the lesion and the character of the displacement, we shall be enabled to treat it appropriately. I am confident that when we come to know

the pathology of these injuries we shall find that a large proportion ought to be treated by operation. The displacement and rotation of the fragments often absolutely prevent their reduction into the normal position, and nothing short of open operation can possibly then be efficient. Here, as in other fractures in children, reduction should be exact and immediate.

Before, however, such improvement in our methods can take place, the great value of the X-rays in dealing with fracture must be universally recognised and their employment be quite systematic, for in this way only can we obtain the all-important information which we desire for fractures about the elbow. We require the most extensive collections of skiagraphs of the elbow in order to appreciate properly each form of injury or recognise the more common forms. Another essential point is the correct interpretation of the skiagraphs, which I am sure can only be brought about by more careful and more extended observation than we have had hitherto. I have known many

mistakes made in the interpretation of skiagraphs of injuries of the elbow, even by eminent surgeons. It requires a large experience on the part of the observer to interpret correctly the picture of a complicated fracture of the elbow in a child. This convinces me that the skiagraphs ought to be submitted to a member of the profession who has had experience in surgical skiagraphy. Many of our hospitals have recognised this by specially appointing a medical superintendent to the X-ray Department. The utility of the Röntgen process in general I will, however, discuss later on.

Time will not permit me to point out the appropriate treatment of each variety of the various fractures and separations at the elbow joint, and I will mention only one example, viz., that of separation of the lower end of the humerus in infancy and supracondylar fracture. After reduction of the displacement of the fragments, I am of opinion that the best treatment is the flexed position at a right angle. It matters little of what material the

splint is composed, whether in the shape of Croft's lateral splints of plaster of Paris, of gutta-percha or mill-board, or wooden posterior rectangular splints, provided the natural deviation of the forearm be respected as well as the obliquity of the line of articulation. I am convinced that as a rule these injuries should be treated with moulded rather than manufactured splints. Dr. H. L. Smith of Boston, U.S.A., in 1894, made a series of experiments on the dead body with the object of determining the best position of the arm in treatment of the fractures involving the joint. He found in fractures of the inner or outer side of the humerus, T-shaped fractures and transverse epiphysial separations, that the deformity was always reduced and the fragments locked firmly in position by flexing the forearm into the acute position (45°), with the forearm semi-pronated. But it is clear that some further practical experience is desirable as to semi-pronation and extreme flexion in the treatment of the different injuries to the lower end of the humerus. In dismissing this

subject I would emphasise the maxim but seldom acted upon in practice: "*Never employ plaster of Paris bandages in the treatment of fractures of the limbs in children.*"

To show how our knowledge of *dislocations* has advanced, I need but mention that towards the close of the Eighteenth Century Mr. Sharpe, an eminent surgeon, denied the possibility of the dislocation of the thigh bone at the hip joint. On the other hand, in his "*Fractures and Dislocations,*"¹ Sir Astley Cooper has given us so classic a description of this as well as of other dislocations, that it is now quoted in even the modern text-books of surgery. The method of reduction of dislocations by manipulation is more and more varied at the present day, as the true pathology of dislocations has become known. We have Bigelow's method of reducing the various dislocations of the hip in place of the severe traction in Sir Astley Cooper's days, while

¹ Sir Astley Cooper, a "*Treatise on Fractures and Dislocations.*" New Edition, by Bransby B. Cooper, 1842.

at the shoulder Kocher's method of reduction is steadily replacing forcible traction on the limb.

Arthrotomy is applicable to recent dislocations which are irreducible by reason of some extraordinary position of the ends of the bone or of the interposition of soft structures. The most favourable time to operate is within forty-eight hours of the dislocation, but if operation is deferred until inflammatory reaction is in progress, an open incision is very liable to be followed by suppuration. The treatment of old dislocation by the open method of free incision, division of opposing structures, and replacement of the head of the bone in its place, is a most successful procedure. The shoulder and the hip have been the parts most frequently operated upon. Some interesting examples relating to the former joint were brought before this Society by Lord Lister¹ in 1891, upon which he had himself operated in Edinburgh. In

¹ *Transactions of the Hunterian Society*, 1891-1892.

other instances, excision of the head of the bone alone suffices to secure a good functional result and has proved most satisfactory.

The commencement of the Century, or rather the year 1828, saw the foundation of *orthopædic surgery*,¹ when Delpech described the mode of dividing the tendo Achillis. But it is a singular fact that Delpech never put into practice that which he advised. The operation of subcutaneous tenotomy, upon which so much orthopædic work depends, was devised and carried out by the genius and labours of Stromeyer of Hanover, probably on the foundation of Hunter's experiments and observations half a century previously. Indeed, some have said that subcutaneous surgery, which has now developed into a very extensive surgical department, was really first instituted by John Hunter; for, as you well know, John Hunter at the age

¹ The term "orthopædia" was first used by M. Andry in his "Orthopædia, or the Art of Correcting and Preventing Deformities in Children," translated into English by Nicholas in 1743.

of forty ruptured his tendo Achillis while dancing. In his enforced rest he¹ "divided the tendon in several dogs, by introducing a couching needle under the skin some distance from it, and killed the dogs at different times, to see the process of union." But the value of subcutaneous division does not appear to have been recognised at the beginning of the Century. We find no reference to tenotomy in any British works of surgery in this period. In 1830 this mode of treatment was introduced into this country by Dr. Little, a pupil and patient of Stromeyer.

Dr. Little, in his lectures on the "Nature and Treatment of Deformities," in 1839, gives the credit of the discovery to Stromeyer alone. This first introduction of the new mode of treatment of club-foot into our country from Germany is worth noting to enable us to appreciate its value. In the *Lancet* of November, 1839, a reviewer of Dr. Little's

¹ "Ottley's Life," vol. i., p. 34.

work observes: "We have on more than one occasion seen that in England charlatans generally endeavour to appropriate to themselves certain operations or modes of treatment of diseases which have been, comparatively speaking, neglected by the regularly educated medical practitioner. Hence we hail with particular pleasure any work of a scientific man which is calculated to diffuse a general knowledge of complaints that have been hitherto neglected or allowed to remain in the hands of ignorant peripatetics." "The treatise of Dr. Little is of this latter class; it contains the most remarkable information on distortion of the foot, a species of malady which, as our readers well know, is even at the time we write (1839) submitted to the care of carpenters and cobblers. The result of the introduction of this new mode of treatment has been the complete study of the causes of individual deformities, the establishment of correct and scientific principles of treatment, and, lastly, the recognition of orthopædic surgery as a special branch of general surgery."

It is interesting to note in this connection that Sir Astley Cooper divided the palmar fascia for the relief of Dupuytren's contraction, but he does not appear to have grasped the principles of subcutaneous surgery, although cognisant of Hunter's observations. Tenotomy was first performed in America in 1834 by Rogers of New York. Dr. E. M. Moore in 1888 relates how, when fifty-one years previously Professor Mütter performed the first operation on the tendo Achillis in Philadelphia, Dr. Rhea Barton protested vehemently against it, and stated that he could not be a party to anything so contrary to good surgery. The great fact of immunity from suppuration when a subcutaneous incision is made, had not yet impressed itself upon the surgical mind in that quarter of the globe.

Stromeyer's idea was that by excluding air from the wound suppuration and its attendant dangers could be avoided, and one might almost look upon antisepsis as a fitting successor to the method of subcutaneous incision.

I hope you will allow me to digress for one moment to speak of mechanical treatment after operation in orthopædic cases. Some mechanical treatment is generally required to complete the cure. Many failures by surgeons in general hospitals to treat deformities are due to the neglect of proper mechanical treatment after the operation has been performed. Mechanical treatment has been much abused and I am as well aware as you are of the snares and pitfalls which beset the practice of some orthopædic surgeons, but I am convinced, after many years of orthopædic practice, that mechanical treatment by proper steel or other supports should be taught in general Hospitals. Plaster - of - Paris splints do not yield such good results. I believe that the mechanical and operative treatment of orthopædic cases "ought never to be considered as antagonistic, but as aids to each other. It is only by the proper combination of the two that the best results can be obtained." J. E. Moore,¹

¹ Jas. E. Moore, M.D., "Orthopædic Surgery," 1898.

U.S.A., says very justly: "The greatest obstacle to the rapid advancement of orthopædic surgery to-day is the tendency of the general surgeon to operate upon every orthopædic case that comes in his way, while the orthopædic surgeon too often refuses to operate, applying an apparatus to every case. Between the man who operates upon everything and the man who operates upon nothing, the poor cripple is often badly treated and orthopædic surgery is brought into bad repute. To my mind the ideal orthopædic surgeon is he who exercises the greatest judgment in drawing the line between the cases that require operation and those that do not, who is equally skilful on the one hand in applying the knife, and on the other in applying the proper apparatus, and who is without prejudice in either direction."

Syndesmotomy is the term introduced some years ago by Mr. R. W. Parker for subcutaneous division of ligaments and ligamentous structures in severe cases of club-foot. In congenital talipes equino-varus, the

site of the operation is below and in front of the internal malleolus, and division of the anterior part of the deltoid ligaments and the fibres of the anterior superior astragaloscaphoid and inferior astragaloscaphoid ligaments is made. This operation is an excellent one and can be combined with division of the tibial tendons.

Tarsectomy, or removal of some of the tarsal bones, or one or other of them, such as the astragalus, is reserved for neglected or inveterate cases of congenital talipes equino-varus, in which the above-mentioned operations, viz., tenotomy and syndesmotomy, have been fully tried and failed. If proper orthopædic treatment has been adopted from the time of birth the necessity for such an operation ought never to occur. Unfortunately neglected cases do from time to time present themselves, but in decreasing numbers. Cuneiform tarsectomy, or removal of a wedge from the outer side of the foot, including the cuboid and other tarsal bones, is also occasionally necessary in old neglected cases of

congenital club-foot. This operation, so frequently performed by surgeons at general hospitals, is a simple one, and the results are satisfactory so far as the deformity is concerned, provided it is undertaken by a surgeon who is sure of aseptic measures, as so many bones and joints are divided. The function of the foot, however, is much impaired, being left shortened, quite rigid, and often useless. I have heard patients state that they preferred the deformed unamputated foot. In this connection I may be permitted to mention that Phelps' operation by free open incision of all the soft structures on the inner side of the foot, just in front of the malleolus, has been for some years on its trial and has not given the satisfaction that was originally claimed for it; at any rate this is my experience of it after a considerable trial.

The *lengthening of tendons* has now been performed for many years, but is still a far from common operation. In so-called *ischæmic paralysis* after fracture, the lengthening of the tendons of the injured muscles has

resulted in a very marked improvement in the power of movement.

The procedure known as tendon transplantation, which consists in attaching to a paralysed muscle the tendon of a healthy muscle, has been recently introduced for cases of paralytic calcaneo-valgus, the tendons of the healthy portion being divided just above the malleolus and attached to the tendo Achillis near its lower end. It remains to be proved how far this method of treatment is ultimately successful in these deformities. It has been recently extended to the treatment of paralytic talipes varus.

Looking at the dread the surgeon had not very many years ago of treating compound fracture of the thigh bone, one cannot but be struck with admiration by the recent reports of Professor Macewen, of more than one thousand cases of *osteotomy* without a bad result. Too great praise cannot be given to this operation of division of a bone by saw or chisel through an open wound for the correction of such deformities as knock-knee,

genu valgum, cubitus valgus, cubitus varus, curvatures of the tibia, and of almost every long bone, deformity from faulty ankylosis of the hip or badly-united fractures, old neglected club-foot, &c. In able hands the operation is a safe and most satisfactory one. Its performance is of daily occurrence and needs no further comment from me.

I pass now to the famous discovery announced in December, 1895, by Professor Röntgen to the Physico-Medical Society of Würzburg, that the rays given off by an electrified Crookes' tube had the power of acting on photographic plates and of penetrating substances in different degrees and exciting fluorescence. Unfortunately the discovery soon attracted much public attention, and many imaginative minds drew uncertain conclusions and spread abroad erroneous impressions on the subject. The ease with which some of the small bones of the body, such as those of the hand, can be reproduced by the X-rays on a photographic plate, has led many unskilled medical practitioners and

laymen to the indiscriminate use, not to say abuse, of this new discovery. The natural consequence has been great discredit, the fate of many other discoveries, even of anæsthesia and antiseptis.

The conclusions arrived at by the Committee of the American Surgical Association¹ last year appear to me to have been drawn up without sufficient consideration and are devoid of that scientific spirit with which all new inventions should be patiently investigated. The errors committed in the study of skiagraphy are mostly attributable to defective interpretation and not to the method itself.

“(1) The routine employment of the X-rays in cases of fracture is not at present of sufficient definite advantage to justify the teaching that it should be used in every case. If the surgeon is in doubt as to his diagnosis he should make use of this, as of every other available means, to add to his knowledge of the case, but even then he should not forget

¹ *American Journal of the Medical Sciences*, July, 1900.

the grave possibilities of misinterpretation. There is evidence that in competent hands plates may be made that will fail to reveal the presence of existing fractures, or will appear to show a fracture that does not exist. (2) In the regions of the base of the skull, the spine, the pelvis, and the hips, the X-rays have not as yet yielded thoroughly satisfactory results, although good skiagraphs have been made of lesions in the last three localities. On account of the rarity of such skiagraphs of these parts special caution should be observed, when they are affected, in basing upon X-ray testimony any important diagnosis or line of treatment. (3) As to questions of deformity, skiagraphs alone, without expert surgical interpretation, are generally useless, and frequently misleading. The appearance of deformity may be produced in any normal bone, and existing deformity may be grossly exaggerated. (4) It is not possible to distinguish after recent fractures between cases in which perfectly satisfactory callus has formed and cases which will go on to non-

union. Neither can fibrous union be distinguished from union by callus in which lime salts have not yet been deposited. There is abundant evidence to show that the use of the X-rays in these cases should be regarded as merely the adjunct to other surgical methods, and that its testimony is especially fallible."

The following conclusions, also drawn up by the Association, as to foreign bodies are a little nearer the truth; "In the recognition of foreign bodies the skiagraph is of the very greatest value; in their localisation it has occasionally failed. The mistakes recorded in the former case should easily have been avoided; in the latter they are becoming less and less frequent, and by the employment of accurate mathematical methods can probably in time be eliminated. In the meanwhile, however, the surgeon who bases an important operation on the localisation of a foreign body buried in the tissues should remember the possibility of error that still exists."

The new light thrown by the X-rays on fractures must, if properly used, considerably

enhance our methods of practice in dealing with them and produce more satisfactory results. Down to the present moment the X-ray apparatus, or rather its pictures, has not been considered a part of the surgeon's equipment, as it should be. I need not again remind you of the great difficulties of diagnosis in fractures at the joints. No fracture of the joints, especially of the elbow, should be treated until an accurate diagnosis has been made and the X-rays employed. It is only then that a splint adapted to the particular requirements of the case can be really satisfactorily applied or a decision as to wiring the fragments arrived at. By means, too, of the X-rays the action of different splints, especially as regards the position of the limb or joint in various fractures, can be studied without removal and the progress of consolidation watched. Indeed, it may be questioned whether treatises on fractures written before the Röntgen era may now be regarded as authentic.

While it is easy, even for a layman, to

understand the signification of most skiagraphs, there are, as we have observed, injuries the correct interpretation of which presupposes, besides thorough anatomical knowledge, the greatest care and a vast amount of experience as to the different modes of delineation in various projection planes.

A distinct skiagraphic plate will always tell the truth. If accompanied by the registration of the details of operation, viz., the source of the current (whether battery, static machine, or from the street supply), the length of spark of the induction coil, the intensity of the tube, the distance of the platinum disc of the tube from the photographic plate, the position of the object, the kind of plates, and the time of exposure, it will be a valid document, intelligible to every expert. And together with the anatomical and clinical knowledge of the expert it should be evidence in a court of law (Beck).

To go a little more into detail, in simple fractures radiography is of immense service in diagnosis. The displacement of the fragments

in their different positions, the amount of overlapping, their form, number, and situation, the presence of splinters (often not detected before), are shown clearly by this process. But it will not give us any information as to the difficulty of effecting exact coaptation by reason of various local conditions in the soft parts, such as the interposition of muscular fibres between the fragments and penetration of fascia by one or other fragment. The use of the X-rays does not supersede the ordinary methods of clinical diagnosis; it supplements them in a most valuable way, especially where great swelling of the soft parts exists. It makes the presence of a fracture clear where otherwise doubt might exist. Many fractures of the carpus, tarsus, and metatarsus, were almost entirely unknown before Röntgen's discovery.

Although the X-rays have not as yet added much to our knowledge of the normal ossification of the bones and epiphyses, yet by their means it is now in our power to make a complete and continuous investigation of the

process of development and growth of the bones in normal health, as well as in such diseased conditions as cretinism, achondroplasia, infantile myxœdema, &c., and to study in these affections the effect of thyroid or other treatment upon the process of ossification. However, in my "Skiagraphic Atlas"¹ of the wrist and hand I have pointed out that the ossification in children born late in the family is much less advanced than in those who come first. For the thorough interpretation of skiagraphs relating to children it is important to have an accurate knowledge of the normal epiphyses and diaphyses at their various periods of development. With respect to older patients also the knowledge of minute anatomical details is essential in order to avoid errors in interpreting the shadows. In the early days of the Röntgen rays the normal sesamoid bones were a frequent source of error; take, too, for instance, the os trigonum tarsi, which has been mistaken for a fragment

¹ John Poland. "Skiagraphic Atlas," of the Hand and Wrist, 1898.

severed from the astragalus. Skiagraphs, in a recent case brought before the Courts of Law in Germany, proved that this small process of bone existed normally on both feet, and that no fracture had taken place. This bone is a typical part of the tarsus in all mammalia, and its frequency in man is estimated as from 8 to 7 per cent. Shepherd, who mistook this bone for a fractured fragment, says, "The fact that this fracture is not mentioned in any of the text-books of Surgery or in special treatises on fractures, would easily be accounted for by its only being discovered by dissection. It causes no deformity, and the symptoms it would give rise to during life would probably be obscure." The same author tried to produce this fracture artificially on the dead body, "but in every case," he says, "where this manœuvre was performed I failed, even where the greatest force was used, to break off the little process of bone."

The practical significance of this bone is evident from a case mentioned by Beck,¹ and

¹ Carl Beck, M.D. "Fractures," 1900, p. 313.

described by Wilmans, which is also highly interesting from a medico-legal standpoint.

“ A labourer claimed that he was injured by an iron bar on January 20, 1897, but was able to work during the whole day. On the following day he called on Dr. Wilmans, complaining of intense pain at his internal malleolus. He limped and asserted his inability to work. Wilmans found a slight swelling below the right internal malleolus. Ecchymosis of the skin being absent, the swelling was attributed to the presence of a considerable degree of talipes, from which the labourer suffered at the same time. The leg was elevated and fomentations were applied for several days. The patient still complaining of great pain, it was decided to transfer him to a hospital for observation. When discharged, after several weeks of treatment, he made an effort to resume work, but at once declared he was unable to keep it up. He was therefore admitted to another hospital, where he repeated this manœuvre several times during a period of six months. Finally he claimed damages for having been crippled by the injury sustained on January 20, 1897, but in view of the negative objective condition found by Dr. Wilmans, the Society against whom he claimed decided not to grant any claims. The consequence was that the man was transferred to the surgical division of a third hospital for further observation. There he complained that he had continuous pains below the right external malleolus, even while in the recumbent position. The pain increased during walking or sitting. Stepping on the right heel he also declared to be impossible. By distracting his attention, however, it was noticed that he could stand well on his heel, and he would undoubtedly have been declared a

malingerer had not the Röntgen rays come to his rescue, at least temporarily. A skiagraph showed a bone-fragment at the junction of the astragalus with the posterior surface of the calcaneum. On the strength of this skiagraphic 'proof,' Dr. Wilmans, although still mistrusting, was forced to modify his original opinion, and certified that the patient suffered from 'fracture of the astragalus, in consequence of which he was damaged for life.' The labourer therefore received an annuity of thirty per cent., in proportion to the estimated curtailing of his wages. Soon afterwards, however, he was discovered by Dr. Wilmans carrying a heavy load without any apparent pain, though formerly he had claimed to be unable to walk without a cane or a crutch. Dr. Wilmans now insisted upon a second exposure to the rays, this time also skiagraphing the uninjured left foot. The skiagraph showed the 'severed bone fragment,' which had first been regarded as a sesamoid of the flexor longus hallucis, but which was now recognised as a normal os trigonum tarsi. The Society of course revoked the annuity, and the German Supreme Assurance Court, to which the man had appealed, not only sustained the decision of the Society, but also decided that the labourer must return the annuity which he had unjustifiably enjoyed for eighteen months."

In *dislocations* radiography has not been found so useful as in fractures, although many instances are recorded where a dislocation previously overlooked has been proved to exist by means of the X-rays. However, it

does not disclose the condition of the soft parts round the articulation, which are the most frequent causes of the difficulty of reduction. In all *deformities* involving the bones the method plays an important *rôle* in determining the character of the lesion, whether congenital absence of radius or tibia, polydactylism or syndactylism, hallux valgus, congenital club-foot, and deformities due to defective growth of the shafts of the bone after injury or disease of the epiphyses.

The use of the X-rays is still in its infancy, but skiagraphy will, I am sure, develop into a science worthy of surgery, provided its study be prosecuted by medical men, or by men having a thorough anatomical training, who would study it in a scientific spirit, with time and opportunity to make it a speciality. I can only hope that it may fall to the lot of some member of this Society to take up this fascinating study in a true Hunterian spirit. It should not, as I have already said, be allocated to the mechanic or photographer, for thereby its development and assistance to the surgeon will be manifestly checked.

The treatment of lupus by the X-rays or by sunlight has as yet met with an incomplete measure of success, although complete cure has resulted in some instances, the scar-tissue becoming quite soft, non-adherent, and non-contractile.

Electricity is another agent which has been recently introduced as an auxiliary to our art and science of surgery, and will in all probability in the near future take a very conspicuous place in the treatment of surgical affections. Although three hundred years have elapsed since Dr. William Gilberd, physician to Queen Elizabeth, placed electricity upon a scientific basis, yet it is only during the latter part of the past century that its value has been appreciated and it has been extensively employed in the diagnosis and treatment of the various paralytic conditions which so frequently come under the notice of the orthopædic surgeon, for the treatment of Duchenne's disease of the limbs, and in the diagnosis of lesions of the nerves in cases of wounds of the extremities, and in fractures

from inclusion in the callus, &c. Before M. Duchenne's time there was no faradic current, and no use was made of electricity for diagnosis. Electro-puncture or electrolysis is the form in which the agent is advantageously employed in aneurysms inaccessible to the surgeon's knife, in nævi of the mixed or subcutaneous varieties otherwise difficult to treat. It is also successfully used as a depilatory, but in the treatment of tumours, goitre, uterine fibroids, &c., there has not been that measure of success which we might have expected.

The treatment of rodent ulcers, lupus, &c., by means of concentrated light, as you know, has just been introduced.

Before closing my address, I will briefly comment upon modern conservative surgery. Sir William Fergusson, it may be observed, was one of the ablest surgeons in advocating and carrying out a line of practice "whereby the loss of a limb might be averted, and the meanest act of surgery, viz., amputating for seemingly incurable disease, might be super-

seded by some more perfect adaptation of surgical science and art " ; and it is no doubt to his enlightened views that we owe much of the present conservative spirit in surgery. We see this conservatism very conspicuously displayed in the present day in severe compound injuries of the limbs, especially in machine accidents. The bones are drilled and wired, the tendons and other soft structures are carefully united by sutures under anæsthetics, and the limb is saved. This happy result is achieved in a very large proportion of successful cases, but most markedly in the case of children. The tables not long ago published by Volkmann upon compound fractures show at a glance the whole story of the great leap made in modern surgery. Again this spirit of conservatism is seen in disease of a joint. What surgeon would amputate an arm for disease of the elbow, or a hand for disease of the wrist? Instead of brilliancy in operations, we require success in their performance as well as in the results. Success is no longer gauged by brilliancy in

operating, or by the time occupied by the surgeon in performing the operation. Moreover, we no longer hear of the "luck" of the surgeon as in days gone by; we have instead to bear the "responsibility," which is an ever-increasing one in surgical art and science. The modern surgeon must be completely devoted to his life's work, he must be not only an anatomist and a pathologist, but also well acquainted with physiology and bacteriology.

All those who know surgery only by the pæans sounded in public during the past few years, are unconscious of the many disappointments and failures that surgeons still experience. A surgical operation is apt to be looked upon by the laity as the most perfect and most precise scientific work possible, and when failure occurs blame is often attributed to the surgeon. A few of these disappointments, mishaps, and failures I have already alluded to in the course of my address.

I think it only right to mention in this connection the valuable help the Nineteenth Century has afforded to the surgeon in the

introduction of the trained nurse, who was unknown at the commencement of this period, and who may be truly described as his hand-maiden. Her work is a most important factor in the efficiency and equipment of the surgical wards in our hospitals, and I have no doubt that she will achieve much in the triumphs of the Twentieth Century.

It would be impossible to assign to every surgeon the share which is justly due to him in the extraordinary progress that has been made during the century. It only remains for me to mention the names of a few out of a long list of those who have laboured, and laboured so well, for the advancement of surgical knowledge and the good of posterity and who have passed away from us: Abernethy, Astley Cooper, Brodie, Charles Bell, Fergusson, Lawrence, Travers, Ward, Spencer Wells, Richard Quain, Cline, Guthrie, Cæsar-Hawkins, J. Henry Green, Partridge, Curling, Savory, Erichsen and Paget, in this country; Boyer, Dupuytren, Larrey, Roux, Lisfranc, Velpeau, Nélaton, Péan and Ollier, in France;

Crampton, Macartney, Colles, Hamilton and Stokes, in Ireland ; Liston, Spence, Syme and Simpson, in Scotland ; Graefe, Rust, Langenbeck, Dieffenbach, Stromeyer, Billroth, Volkmann, Thiersch, Nussbaum, and Gurlt, in Germany ; Scarpa and Porta, in Italy ; Physick, Mutter, Gross, Post, Mott, Nathan-Smith, Hodgen, the Warrens, Marion Sims and Bigelow, in America.

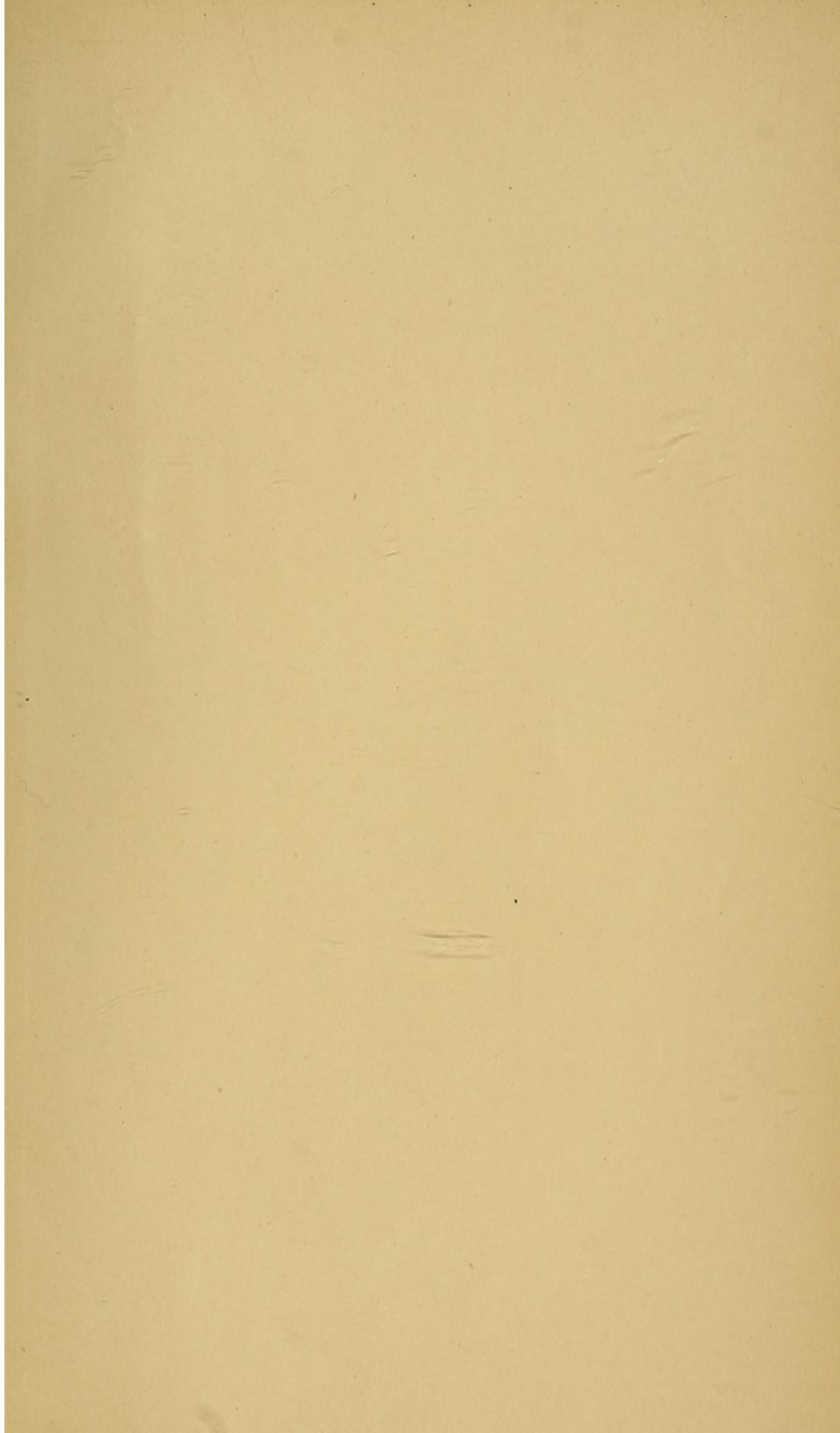
The Century has gone to its tomb with these great names and their great deeds inscribed on it, long to preserve the memory of the greatest epoch in surgical science.

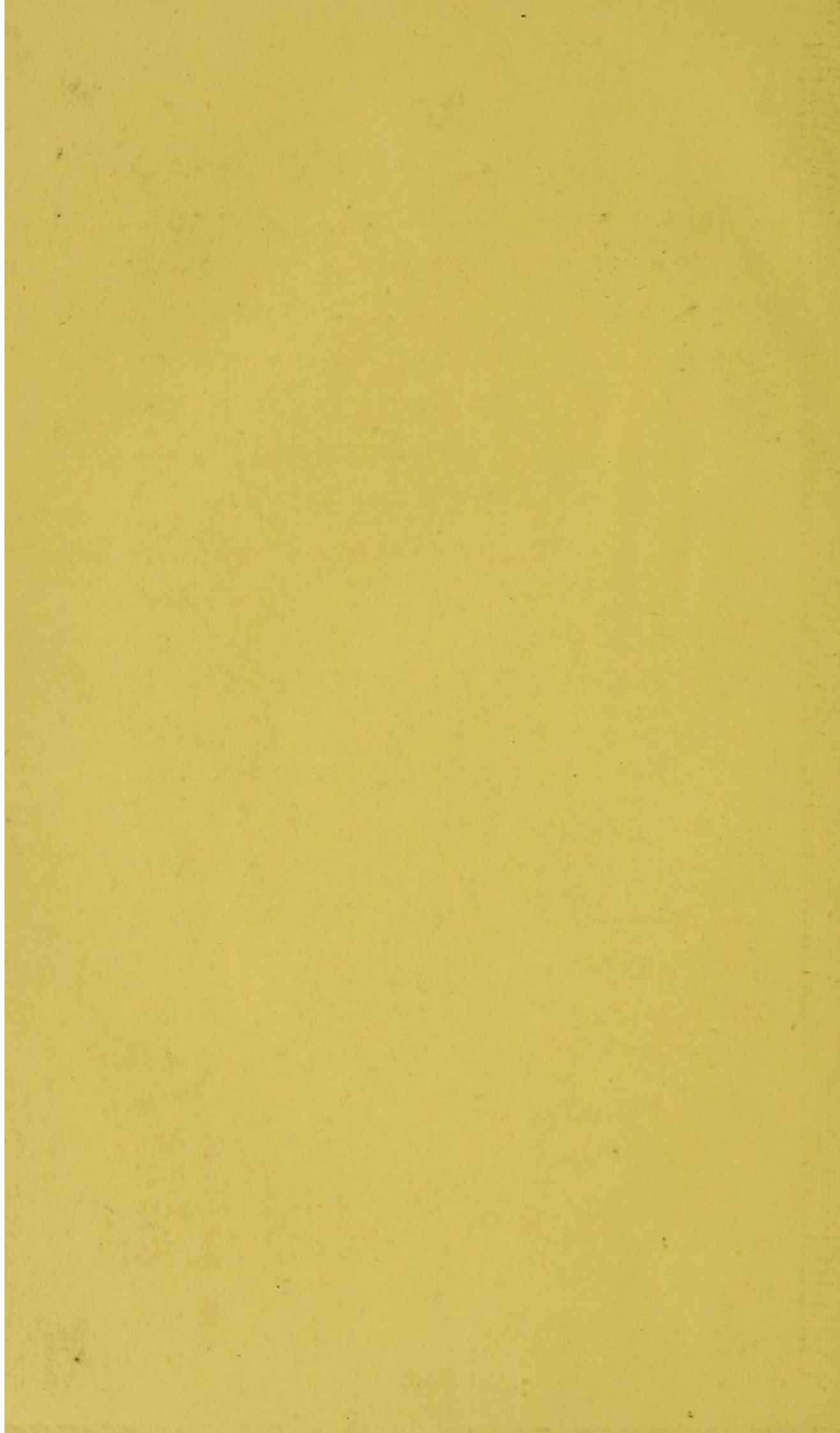
Others still living have filled up the ranks in numbers too great to mention, but each has added, and is adding, his contribution to this glorious chapter of colossal industry in the surgical history of the Nineteenth Century. I do not wish to depreciate the labours of men who passed away one hundred years ago, for I am convinced that their interest in surgical science, and their love of work, were not less than ours. The opportunities of those of us who live at

the commencement of the Twentieth Century are incalculable, the array of scientific facts which we inherit is vast as compared with that of one hundred years ago. So much greater will be the achievements expected of us in the Century which has just opened a new chapter in surgical science. No one can say whether the Twentieth Century will equal or surpass the Nineteenth, but it is unlikely that most of the greater discoveries have now been made, and that surgical science in the future will be chiefly occupied with details and the application of principles already known. We cannot have approached finality. Shall we find, for instance, at some not distant date, a cure for that increasing scourge of the human race, cancer?

To conclude with the words of Byron, "The best of prophets of the future is the past."

the comparison of the two countries
 may be made by the way of statistics
 that which we select is not so compared
 with that of our country, but we
 must consider it to be the same as
 that of us in the country which has just
 passed a new chapter in its history
 No one can say whether the French
 country will equal or surpass the English
 but it is highly probable that the
 character of the new government, and the
 rapid extension of the public utility
 compared with the old, and the application of
 sciences already known. We cannot have
 a greater history, that we had for
 the last of the world, and which was
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